CULTURAL RESILIENCE AND RESOURCE EXTRACTION: PRESERVING PLANTS & PEOPLE OF DEGRADED ECOSYSTEMS

57TH ANNUAL MEETING OF THE
SOCIETY FOR ECONOMIC BOTANY
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President’s Letter

On behalf of the Conference Organizing Committee and the society’s officers and council, I am delighted to welcome you to the 57th annual meeting of the Society for Economic Botany. The conference theme of *Resilience in the Face of Resource Extraction: Ethnobotany and Exploitation* is a timely one, reflective of factors impacting communities across the globe. I look forward to the many excellent talks and posters scheduled for the week, which will address different approaches to the conservation of biodiversity and cultural traditions in a period of increasing globalization and transition. Southern Appalachia is a wonderful venue for such a conference, where culture is still deeply connected to the land, and yet economic tensions also play a powerful role in shaping human relationships with the environment.

In addition to a full and dynamic scientific program, we are excited to offer a number of special events and activities, including OSN-sponsored workshops, a service activity to give back to the local community, a student social sponsored by the United Plant Savers, a nature camp for children of conference attendees, a folk dance, and a special symposium from past Distinguished Economic Botanists. I am honored this year to have the opportunity to present the Distinguished Economic Botanist award to Tony Cunningham. We look forward to hearing his engaging lecture at the banquet.

SEB is so fortunate to have a dedicated team of individuals and groups that made this meeting possible. We owe great deal of thanks to our local hosts at Pine Mountain Settlement School, to the SEB business office, and to our sponsors: The Open Science Network, United Plant Savers, Nature-Springer, and Shoots and Roots Bitters. Great thanks are also due to our fantastic conference organizing committee: Sunshine Brosi, Adam Brown, Steve Casper, Geoff Marietta, Sky Marietta, and Laura Smith.

One of the most special aspects to SEB meetings is the opportunity to not only engage in scientific discourse, but to also reconnect with friends and colleagues. We also value mentoring opportunities for the next generation of scientists in this field. I encourage you to take part in the networking and social activities planned during the meeting; this is a great time to both visit with old friends and make new ones! If you are attending the meeting for the first time, or are a new student to the field, I look forward to meeting you!

I wish you all a productive and engaging week here in Pine Mountain and I hope to also see you in future meetings! Planning activities for our next two annual meetings are already underway and I hope that you’ll join us in Bragança, Portugal in 2017 and Madison, Wisconsin in 2018!

Sincerely,

Cassandra Quave 2015-2016 President of the Society for Economic Botany
Emory University, Atlanta, Georgia, USA
Acknowledgements

We are delighted to be hosting the 57th annual Society for Economic Botany conference at Pine Mountain Settlement School in Kentucky, USA. We thank the staff at Pine Mountain Settlement School for making this conference a success. Particularly, Deb Callahan for handling the reservation process, Joyce Scearse and the kitchen staff for preparing meals and cleaning, and Susan Brown and the program staff for leading daily and evening activities. Every conference demands months of preparation and planning and we could not have accomplished what we have without the guidance and help of many individuals and organizations. The proposal to hold the conference in Pine Mountain originated with Sunshine Brosi. Our conference logo was beautifully designed by Sky Marietta. Our hands-on workshops on Teaching Tuesday, a concept for emphasizing teaching that originated at the 2012 SEB conference in Frostburg, Maryland, were organized by Sunshine Brosi, Janelle Baker, Sonia Peter, and Linda Black Elk representing the Open Science Network (OSN), who also organized an OSN folk dance reception for Tuesday evening. We thank our field trip leaders for their willingness to go above and beyond in showcasing unique aspects of Pine Mountain to conference participants: Susan Brown who laid the groundwork for all our field trips, and leaders Ralph Thompson (Berea College) and Sunshine Brosi (Frostburg State University). Our gratitude is furthermore extended to those who organized judging the student contestants, Trish Flaster. And to those who agreed to act as session chairs – thank you for helping to keep us on schedule.

A number of people were instrumental behind the scenes in posting our web pages, coordinating societal tasks, organizing registration, and generally getting this conference up and off the ground. We would like to thank the Botanical Society of America for their assistance particularly Heather Cacanindin, William Dahl, Rob Brandt, and Johanne Stogran. Our student representatives devoted a lot of time to imaginatively creating wonderful conference experiences for our student attendees include John de la Parra. We thank Gabe Echeverri for his artwork on the t-shirts and his donation of wild root beverages. We would like to thank the mentors who volunteered to chat with students over lunch. We invite you to explore Eastern Kentucky, while you are here at the conference, and hope that you enjoy meeting with your colleagues and making new friends as much as we do! We thank the filmmaker of our amazing Appalshop Films and Ada Smith, Josh May, and Eagle Brosi for organizing the collaboration with Seedtime on the Cumberland and the showing of several Appalshop Films.

We would like to dedicate this conference to the amazing teachers who shaped Pine Mountain and changed so many young lives in Appalachia. Particular recognition goes to Connie Carol Fearington Brosi, Mildred Mahoney, Burton & Mary Rogers, Lucy Barker Hennigan, Katherine Pettit, Ethel de Long Zande, and the many others who sought to educate mountain children toward, rather than away, from their home and culture, following in the Settlement School tradition.

- The Organizing Committee: Chaired by Sunshine Brosi, Members include: Steve Casper, Sky Marietta, Geoff Marietta, Adam Brown and Laura Smith.
Distinguished Economic Botanist
Tony Cunningham

Over the past 35 years, Tony Cunningham has made major contributions to economic and ethnobotany and embodies the spirit of the Distinguished Economic Botanist. He is outstanding in his dedication and passion to advancing scientific research; promoting sustainable and environmentally and socially just livelihoods; and mentoring students on people-plant relationships. He has been a pioneer in linking traditional knowledge, local resource use, and conservation, is a foremost leader in the field of Ethnoecology. He is also widely known for his developing a suite of rigorous research methods for studying the formal and informal market systems of non-timber forest products as a means to evaluate the in situ effects of harvest for plant and animal species with both local and global value as a way to inform conservation prioritization.

Tony’s PhD through the University of Cape Town (1980-1985) was a ground-breaking quantitative study of the values of plants to local people. In 1986, he started South Africa’s first ethnobotany programme (the Southern Life Ethnobotany Programme at the Institute of Natural Resources, University of KwaZulu/Natal) where in addition to mentoring students, he carried out the first detailed study of the traditional medicine trade in South Africa—-not an easy task at a time of burning barricades and assassinations under apartheid. On the cusp of leaving South Africa in 1991 he wrote the framework for the national program that continues today as the Indigenous Plant Use Forum (IPUF). In 1992, together with Alan Hamilton and Gary Martin, he started the WWF/UNESCO/Kew “People and Plants Initiative,” coordinating its Africa program. This has enabled him to mentor many students in Uganda, Kenya and Tanzania and support projects with colleagues in Zimbabwe and Cameroon. In the process, he also wrote the practical book, “Applied ethnobotany: people, wild plant use and conservation” which is very widely used for teaching purposes at universities across the world and in available in English (2001), Spanish (2002) and Chinese (2004). In 2004, Tony was GP Wilder Chair in the Department of Botany, University of Hawai‘i, where he developed and taught an inter-disciplinary ethnoecology course that bridged marine and terrestrial environments, focusing on resource management linked to local livelihoods and species in trade. An expert on African basketry and the ethnobotany of Asian textiles, he spent 25 years working on an unfunded project culminating in the book “African basketry: grassroots art from southern Africa” (2006, with M E Terry) and most recently, for a major exhibition at the Fowler Museum, UCLA, “Plants as the pivot: the ethnobotany of Timorese textiles” (2014). Although he has been based in Australia for many years, he has continued to support and mentor researchers in many parts of Africa and Asia.

Tony has made enormous contributions to the fields of Ethnobotany and Ethnoecology, and through his teaching, research, articles, books, and videos, he has inspired students across the globe. He is driven by a true dedication to indigenous and local communities and to conservation. He is a role model because of his high standards in ethics, demonstrated by his research that truly engages, collaborates with, and shows respect for local stakeholders; ensures the protection of intellectual property rights; and recognizes local counterparts as co-authors and collaborators. He is most dedicated, passionate, enthusiastic and tireless in his work to advance the science and social justice centered on people and plants.
Conference Venue

Pine Mountain Settlement School (www.pinemountainsettlementschool.com) is located in the rural mountains in the heart of the southern Appalachians in rural Southeastern Kentucky, USA. The 100-year old Settlement School transitioned into an Environmental Education Center in the 1970s. The school was an early source of education for the mountain youth of the area, offering a hands-on approach to education that continues to be a model for the school. Pine Mountain Settlement School’s programs have evolved to meet the changing needs of the community and region, with a core goal to educate the youth of rural Eastern Kentucky.

Conference Collaborators

Frostburg State University
Frostburg State University, www.frostburg.edu, is celebrating the graduation of thirty students in the undergraduate Bachelors of Science in Ethnobotany since the program’s inception in 2007 and the first graduates in 2010. Located in the Appalachian Mountains of western Maryland the program is situated in an ideal location for field-based courses which integrate research and service learning. The field-based program’s graduates are primarily employed in ethnobotanical fields related to applied conservation projects. Come join us during the poster session to learn about the careers of graduates of Frostburg State University’s Ethnobotany Program and meet several returning alumni and current students.

Appalshop

Widely recognized for its commitment to developing a vibrant community-based arts presence in Appalachia and beyond, Appalshop (www.appalshop.org) is a nonprofit arts and education center based in eastern Kentucky. Established in 1969 as a media-training program, Appalshop has developed into a multi-disciplinary arts and social justice organization. The staff of 15+ full-time workers currently produces documentary films, tour original musical theater, present community arts programming and conduct a variety of youth educational and arts training programs. Seedtime on the Cumberland, seedtimefestival.org, is an annual summer festival celebrating Appalachian people, music, arts, and culture. Seedtime activities include a watermelon eatin’ and spittin’ contest, a hollerin’ contest, and demonstrations of broom making and woodworking.
Kentucky Natural Lands Trust
Kentucky Natural Lands Trust (KNLT), www.knlt.org, is a statewide land trust committed to preserving, restoring and connecting the state’s remaining wildlands. With only one-half of one percent of the land in Kentucky in pre-settlement condition, these efforts are now more critical than ever. KNLT is committed to preserving Kentucky’s diminishing natural places, protecting its rich biodiversity and ensuring a future that will continue to inspire new generations of environmental stewards. Efforts began with the preservation of Blanton Forest, expanded to the Pine Mountain Wildlife Corridor, and now include a range of conservation projects. KNLT uses a wide variety of tools to conserve natural areas and to work with forest landowners.

Conference Sponsors

United Plant Savers
The Student Social on Monday Night is sponsored by United Plant Savers (UpS), www.unitedplantsavers.org. United Plant Savers’ mission is to protect native medicinal plants of the United States and Canada and their native habitat while ensuring an abundant renewable supply of medicinal plants for generations to come. The work of United Plant Savers involves research, education and conservation of native medicinal plants and their habitats. UpS encourages students to participate in their annual internship program designed to give hands-on experience in propagating native medicinal plants.

Shoots & Roots Bitters
Shoots & Roots Bitters (http://www.shootsandrootsbitters.com/) is a NYC-based company of three botanists bringing the flavor and stories of plants from around the world to your beverage through science-based craft bitters for a remarkable taste of botanical diversity. Bitters are botanical infusions (herbal supplements) that extract the vital flavor and medicinal properties of plants. People have been preparing bitters and related herbal remedies including elixirs and tinctures for centuries for wellbeing and flavor. Bitters emerged in Western pharmacies over 200 years ago where they were mixed with soda water or alcohol in order to treat a wide range of ailments from digestive issues to the common cold. From there, the use of bitters evolved to adding a splash of flavor and medicinal properties to cocktails and other drinks. Shoots & Roots Bitters draw from past traditions with new formulas that celebrate the world's diversity of plants, cultures and flavors. Each of our blends tells a place-based story of a specific geography and includes under-utilized plants. Add a splash of Shoots & Roots Bitters to soda water, spirits, teas and tisanes to create a drink popping with diverse flavors.
Open Science Network in Ethnobiology

Teaching Tuesday Workshops and events are sponsored by the Open Science Network in Ethnobiology, www.opensciencenetwork.org. We are ethnobiology educators, dedicated to evidence-based teaching methods. In addition, we want to help other ethnobiology instructors by linking to a variety of instructional materials for ethnobiology courses and curricula. Our content is organized around ethnobiology core concepts and competencies, determined by a core set of educators for the purpose of increasing rigor in content and coursework. All materials on our links are freely shared using an open-systems philosophy. We welcome additions and use of this collection. Core concepts and competencies are listed in the OSN Vision and Change document. We also encourage the upload and sharing of resources made possible by the Life DiscoveryEd Digital Library. The Life DiscoveryEd Digital Library allows resources to go through a peer review process and become available for other educators. In addition, the OSN site houses links to resources that are stored on other pages such as university web servers or cloud-based resources.

In the Footsteps of Lucy Braun

Friday and Saturday after the conference Pine Mountain will host their annual E. Lucy Braun Weekend. Pine Mountain Settlement School's weekend forest study workshop is named in honor of one of the first and foremost conservationists of the 20th century, E. Lucy Braun. Dr. Lucy, as she was called by her colleagues, devoted her life to the study of plants and to conservation campaigns to save wilderness areas and other natural sites. In the 1920s and '30s, she conducted field trips to gather information for her study of the forests of Eastern North America. Her travels brought her to the Southern Appalachians, including areas around the Settlement School. On these field trips, Dr. Braun and her sister Annette, a zoologist, drove their Model T Ford through the mountains to collect plant specimens. Dr. Braun's analysis of the information collected on these field trips resulted in her book "Deciduous Forests of Eastern North America." This book was the definitive text on the subject when it was published in 1950 and it remains so today.

In 1930, Dr. Braun and Katherine Pettit, one of the founders of Pine Mountain Settlement School, campaigned to save a virgin forest on Lynn Fork of the left fork of Leatherwood in Perry County. They were not successful, and the forest there was subsequently cut down. Pine Mountain's forest study workshop includes hikes to different types of forests; all are within an hour's drive of the Settlement School. Workshop participants will also see the effects of coal mining, logging and gas well drilling on the area's forests. Daily field trips will include four- to eight-mile hikes. Field trips are planned to various forest types and habitats including remnant old growth forest and high elevation mixed mesophytic forests.

Springer Nature

Springer Nature is the world’s largest academic book publisher, publisher of the world’s most influential journals and a pioneer in the field of open research. The company supports student awards to attend and present research at the conference.
## Schedule at a Glance

Breakfast: 7:30am-8:45am, Lunch: noon-1pm, Dinner: 5-6pm, all events in the Laurel House unless noted

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<tr>
<th>Date</th>
<th>Events</th>
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| **Friday & Saturday 3, 4 June** | - Pre-conference Event: Appalshop’s Seedtime on the Cumberland Festival  
- Shuttle leaves Pine Mountain at 12:30pm on Friday, 8:30am on Saturday and leaves Seedtime at 11pm both days for a 12:30am arrival |
| **Sunday 5 June 2015** | - SEB Council Meeting (9am-5pm) *Laurel House Conference Room*  
- Late Afternoon: Registration (3-5pm)  
- Welcome Dinner: BBQ fundraiser for Kentucky Natural Lands Trust (5-8pm), Jam Session with Kevin Howard feel free to join in |
| **Monday 6 June 2016** | - Registration (7:30-8:30am)  
- Welcome and Keynote Speaker (9am-noon)  
- Symposium 1: Plenary invited presentations, Appalachian Mountain Cultures & Plants  
- Symposium 2: People and Plants: Cultural Ethnobotany  
- E. Lucy Braun’s Plants Presentation (6:30-7:30pm)  
- United Plant Savers Student Social (8-10pm) |
| **Tuesday 7 June 2016** | - Open Science Network Teaching Tuesday Workshops (9am-noon) *Various Locations*  
- Service Project (1-2pm)  
- Poster Session (2-5pm) *Draper*  
- Open Science Network Contra Dance (6-9pm) Music by Sunrise Ridge with caller James Boggs |
| **Wednesday 8 June 2016** | - Symposium 3: Fulling Contestants  
- Symposium 4: Conservation Ethnobotany  
- Panel Discussion: Kentucky Hemp Industry  
- Kentucky bourbon tasting, sponsored by Shoots and Roots Bitters (6-9pm) |
| **Thursday 9 June 2016** | - Symposium 5: Medical Ethnobotany and Phytochemistry  
- Symposium 6: Applied Ethnobotany  
- Panel Discussion: The Future of SEB: The Discussion Continues  
- SEB Business Meeting  
- Distinguished Economic Botanist banquet, lecture, & awards ceremony (5-9pm) Music by Frank Farley and Sons |
| **Friday & Saturday 10, 11 June** | - Departure (12:30pm)  
- Post-conference Event: In the Footsteps of Lucy Braun—details provided to enrolled participants, spaces still available |
### Meeting Program

#### Pre-Meeting Events

**Laurel House**

**Friday, JUNE 3, 2016**
- **12:30 PM** Shuttle leaves Pine Mountain for Seedtime on the Cumberland Festival
- **11:00 PM** Shuttle leaves Seedtime for a 12:30am arrival at Pine Mountain Settlement School

**Saturday, JUNE 4, 2016**
- **7:30-8:30 AM Breakfast**
- **8:30 AM** Shuttle leaves Pine Mountain for Seedtime on the Cumberland Festival
- **11:00 PM** Shuttle leaves Seedtime for a 12:30am arrival at Pine Mountain Settlement School

**Sunday, JUNE 5, 2016**
- **7:30-8:30 AM** Breakfast
- **8:30 AM-4:30 PM** SEB Council Meeting, Conference Room, Laurel House
- **3:00-5:00 PM** Registration
- **5:00-8:00 PM** BBQ fundraiser for Kentucky Natural Lands Trust

#### Post-Meeting Events

**Laurel House**

**Friday, JUNE 10, 2016**
- **12:30 PM** Shuttle leaves Pine Mountain

**Saturday, JUNE 11, 2016**

*Lucy Braun*
MONDAY, JUNE 6, 2016

7:30-8:45 AM  Breakfast

SYMPOSIUM 01: APPALACHIAN MOUNTAIN CULTURES & PLANTS  9:00 AM - 2:00 PM

9:00-9:15 AM  Welcome & Announcements  Cassandra Quave
President, Society for Economic Botany

9:15-9:40 AM  SY01001  Geoff Marietta
Director, Pine Mountain Settlement School
Resilience, Resources, and Regeneration: Welcome to the Future of Pine Mountain Settlement School

9:40-10:30 AM  Keynote SY01002  Ralph Thompson
Berea College
A Vascular Flora of Pine Mountain Settlement School and James E. Bickford State Nature Preserve, Harlan County, Kentucky

10:30-11:00 AM  Break

11:00 AM-12:00 PM  SY01003  Greg Abernathy
Kentucky Natural Lands Trust
Pine Mountain Wildlands Corridor, an Ecological Treasure and the Largest Conservation Project in Kentucky's History

12:00-1:00 PM  Lunch
1:30-2:30 PM SY01004 Ada Smith
Ethnographic Media from Appalachia
Director, Appalshop

2:30-3:00 PM Break

**SYMPOSIUM 02: PEOPLE AND PLANTS: CULTURAL ETHNOBOTANY 2:45 PM-4:15 PM**

3:00-3:15 PM SY02001 Mark D Merlin
**Kentucky Hemp: Entwined in Slavery, Sharecropping and Profits for the Elite (1775-1937)**

3:15-3:30 PM SY02002 Bradley C. Bennett
Science in Fiction: The Yearling and Ethnobotany in Northern Florida

3:30-3:45 PM SY02003 Kim Bridges
The Science of Survival: An Unexpected Example

3:45-4:00 PM SY02004 Valentina Savo
Local Observations of Rainfall Changes

4:00-4:15 PM SY02005 Maria Fadiman
**Kauri (Agathis australis) Ethnobotany: Identity, Conservation and Connection in New Zealand**

5:00-6:00 PM Dinner

6:30-7:30 PM Sunshine Brosi
Lucy Braun’s Plants and Places Frostburg State University, Ethnobotany Program

8:00-10:00 PM United Plant Savers Student Social
TEACHING TUESDAY, JUNE 7, 2016 Sponsored by the Open Science Network

7:30-8:45 AM Breakfast

ETHNOBIOLOGY EDUCATION WORKSHOPS 9:00 AM-12:00 PM
Open Science Network Hands-On Ethnobiology Workshops, Locations Posted

**Laboratory or Investigator Websites.** Andrew Semotiuk, People often do not have, or have a very poorly up-kept lab or personal website. So the workshop would and should provide very simple steps to create a website that is quickly manageable where the investigator can promote themselves or their lab. *Draper, 2nd floor, Animal Room*

**Nature Journaling.** Sky Marietta, Grab your sketch book and head outside to do some observation-based nature journaling. Participants will document the small treasures on the forest floor as well as capturing the landscape. *Library, Main Floor, Foyer*

**Taste, smell, touch & sound for Plant Identification** Susanne Masters, Exploring different groups of plants and algae using non-visual characteristics to differentiate between different species. Looking at plants and algae in different ways draws attention to the properties that they are valued for. Using other features is also an important way of recognizing different species in situations from market stalls to customs border check points where visual characteristics are not available for example when plants are in trade having been processed. *Plant Center, Main Room*

**Implementing problem-based learning in the classroom through interactive case studies.** Ryan Huish, Participants will learn of pedagogical resources and objectives for implementing case studies in the classroom. Principles of problem-based learning will be illustrated during an interactive case study on a rare, culturally and economically valuable sandalwood species in the South Pacific. *Draper, 3rd floor, Geology Room*

**Knowing Nature: Classroom Observations,** Gail Wagner, Participants explore ways to incorporate phenological observations into classroom assignments, including NPN, Project Budburst, and recording herbarium specimens. Learn how to record results through time via scatter plots, and make a Videolicious movie. *Library, Main Floor, Community Room*

**Wood Turning Demonstration,** Dan Moerman, Participants will watch a demonstration where Dan will make a small wooden vase. *Draper, 2nd floor, Woodshop*

**Weaving Together Ethnobotany,** Sunshine Brosi, Participants will learn to weave on a 4 or 6-harness loom and will bring home a small woven end table cover and hear stories about growing up in Kentucky. *Draper, 3rd floor, Weaving Room*

**Corn Shuck Flowers,** Susan Brown, Participants will make a botanically accurate corn shuck flower. *Draper, 3rd floor, Stained Glass Room*

**The science of Ethnobotany: moving past the “awkward teenager” stage?** Nanci J. Ross and Hank Stevens, no limit, This workshop will tackle a central issue in ethnobotany: a conceptual theoretical framework for this highly interdisciplinary science (ex., McClatchey 2006, Albuquerque and Hanazaki 2009, Ramos et al. 2012). Philosopher Thomas Kuhn described an immature science as one
that lacks such a guiding framework, thus making collective progress in our science and education difficult. Does ethnobotany have one? Should it strive for one? Workshop participants will work together to take a first step in identifying key theories, approaches, and exemplars in Ethnobotany. 

_Draper, 3rd floor, Spinning Room_

**Student Involvement in the Society**, presented by John de la Parra. Students will learn how to engage with the Society and learn about awards given by the Society and benefits of student membership.

_Laure House, Main Floor, Living Room_

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<tr>
<th>Time</th>
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<tr>
<td>12:00-1:00</td>
<td>Lunch</td>
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<td>1:00-2:00 PM</td>
<td>SERVICE PROJECT</td>
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<td>2:00-5:00 PM</td>
<td>POSTER SESSION</td>
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<td>5:00-6:00 PM</td>
<td>Dinner</td>
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<tr>
<td>6:00-9:00 PM</td>
<td>CONTRA DANCE, Sunrise Ridge with caller James Boggs</td>
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**WEDNESDAY, JUNE 8, 2016**

*7:30-8:45 AM  Breakfast*

**SYMPOSIUM 03: FULLING CONTESTANTS**

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<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>9:00-9:15 AM</td>
<td>SY04001</td>
<td>American Indian Botanicals as Possible Alternatives to Hormone Therapy during Menopause</td>
<td>Tristesse Burton</td>
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<tr>
<td>9:15-9:30 AM</td>
<td>SY04002</td>
<td>Toward an industrial ethnobotany: Social dynamics of plant use in green infrastructure</td>
<td>Megan Carr</td>
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<td>9:30-9:45 AM</td>
<td>SY04003</td>
<td>Ethnobotanical Implications of Stress-Induced Alkaloid Production in Medicinal Plants</td>
<td>John de la Parra</td>
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<td>9:45-10:00 AM</td>
<td>SY04004</td>
<td>Correlates of Herbal use for Pain Management in an Appalachian Chronic Pain Population</td>
<td>Termeh Feinberg</td>
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<tr>
<td>10:00-10:15 AM</td>
<td>SY04005</td>
<td>Reproductions of colourful Iron Age bands from the salt mine of Hallstatt: an interdisciplinary approach to acquire knowledge of the dyeing technology of the Hallstatt Culture in central Europe</td>
<td>Anna Hartl</td>
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<td>10:15-10:30 AM</td>
<td>SY04005</td>
<td>Interdisciplinary Approaches to Interpreting Nontimber Forest Product Harvest Distributions in Appalachia</td>
<td>Steve Kruger</td>
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<td>10:30-11:00 AM</td>
<td><strong>Break</strong></td>
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<tr>
<td>11:00-11:15 AM</td>
<td>SY04006</td>
<td>Evaluation of antimicrobial activity, toxicity, phytochemical screening of selected medicinal plants of Losho, Narok county, Kenya</td>
<td>Duncan Mutiso Chalo</td>
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<td>11:15-11:30 AM</td>
<td>SY04007</td>
<td>Fish-to-School Community-based process for strengthening local food systems in Western Alaska</td>
<td>Jennifer Nu</td>
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<tr>
<td>11:30-11:45 AM</td>
<td>SY04008</td>
<td>Geospatial Analysis of Pest Vulnerability in Street Trees in the District of Columbia</td>
<td>Laura Smith</td>
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<td>11:45-12:00 PM</td>
<td>SY04009</td>
<td>Chelsie Romulo</td>
<td>Fruit Trade in Loreto, Peru: Market Drivers for Extraction and Potential for Conservation Interventions</td>
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<tr>
<td>12:00-1:00 PM</td>
<td>Lunch</td>
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<td>1:30-1:45 PM</td>
<td>SY04010</td>
<td>Andrew Semotiuk</td>
<td>Unraveling the Mysteries of <em>Ibervillea sonorae</em>, a Phenom of Mexican Traditional Medicine</td>
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<td>1:45-2:00 PM</td>
<td>SY04011</td>
<td>Grady Zuiderveen</td>
<td>Stocking the Hunting Ground: Insights Into the Supply of Wild Ginseng (<em>Panax quinquefolius</em> L.) From Pennsylvania, U.S.A., and Implications Regarding Industry Tracking of an Important Internal</td>
</tr>
<tr>
<td>2:00-2:15 PM</td>
<td>SY04012</td>
<td>Tran Thi Hoa</td>
<td>Utilization and conservation of a hardwood medical forest species: <em>Xerospermum noronhianum</em> (Sapindaceae)</td>
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<tr>
<td>2:15-2:30 PM</td>
<td>SY04013</td>
<td>Charles Stephen Wagner</td>
<td>Antibacterial Activity of Medicinal Plants from The Physicians of Myddvai1 3rd Century Welsh Medical Text</td>
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<td>2:30-3:00 PM</td>
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<td>3:00-3:15 PM</td>
<td>SY04001</td>
<td>Alison Ormsby</td>
<td>Sanctuary Networks for Medicinal Plant Conservation</td>
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<tr>
<td>3:15-3:30 PM</td>
<td>SY04002</td>
<td>Letitia McCune</td>
<td>Methods of IPR protection: Examples of agreements and permitting requirements</td>
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<tr>
<td>3:30-3:45 PM</td>
<td>SY04004</td>
<td>Annie Virnig</td>
<td>Moving Beyond Blueprint Solutions: Evaluating Conservation Success Across Diverse Equator Initiative Cases Studies</td>
</tr>
<tr>
<td>3:45-4:00 PM</td>
<td>SY04005</td>
<td>Lisa Castle</td>
<td>Lessons Learned from Ranking Medicinal Plants</td>
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<tr>
<td>4:00-4:15 PM</td>
<td>SY04006</td>
<td>James R Veteto</td>
<td>Biodiversity in a Bottle: The Mead Circle Phenomenon in Southern Appalachia</td>
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<td>5:00-6:00 PM</td>
<td>Dinner</td>
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<td>6:00-9:00 PM</td>
<td>Kentucky Bourbon Tasting</td>
<td>Sponsored by Shoots and Roots Bitters</td>
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THURSDAY, JUNE 9, 2016

7:30-8:45 AM Breakfast

SYMPOSIUM 05: MEDICAL ETHNOBOTANY AND PHYTOCHEMISTRY  9:00-10:30 AM

9:00-9:15 AM    SY05001    Linda S. Black Elk
Love Medicine: Plants, Animals, and Affection

9:15-9:30 AM    SY05002    Sonia Peter
Resilience in the African Diaspora - Pre 1834 Ethnomedicine in Barbados

9:30-9:45 AM    SY05003    Manuel Pardo-de-Santayana
Sharing plant uses with animals. Plants used for feeding and curing humans and animals in the Spanish Inventory of Traditional Knowledge related to Biodiversity

9:45-10:00 AM   SY05004    Cassandra Quave
Ethnobotanical discovery of plants and fungi with antibacterial activity against Propionibacterium acnes

10:00-10:15 AM   SY05005    James Lyles
Investigation into the chemical paradox of a Hypericum perforatum (St. Johns Wort) traditional skin remedy

10:15-10:30 AM   SY05006    Heike Vibrans
Ruderal vegetation as a source of medicinal plants in Mexico

10:30-11:00    Break

SYMPOSIUM 06: APPLIED ETHNOBOTANY  11:00AM-12:00PM

11:00-11:15 AM    SY06001    Steven J. Casper
The Role of Ethnobotanists in Regulation

11:15-11:30 AM    SY06002    Blair Orr
Ethnobotany in Peace Corps Master’s International Programs

11:30-11:45 AM    SY06003    Nadia Navarrete-Tindall
Protecting and Growing Allium tricoccum (wild leeks) as a Specialty Crop in Missouri

11:45 AM-12:00 PM SY06004    Mary Hufford
Resilience in Lucy’s Woods: The Mixed-Mesophytic Seasonal Round As a Framework for Post-mining Restoration
<table>
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<th>Time</th>
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<tr>
<td>12:00-1:00 PM</td>
<td>Lunch</td>
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<tr>
<td>Panel Discussion</td>
<td>Rick Stepp The Future of SEB The Discussion Continues 1:30-2:30 PM</td>
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<tr>
<td>2:30-3:30 PM</td>
<td>SEB Business Meeting</td>
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<tr>
<td>3:30-3:15 PM</td>
<td>Break</td>
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<tr>
<td>5:00-6:30 PM</td>
<td>Distinguished Economic Botanist Banquet</td>
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<td>Distinguished Economic Botanist Lecture</td>
<td>Tony Cunningham 6:30-7:00 PM</td>
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<tr>
<td>Awards Ceremony</td>
<td>7:00-8:30 PM</td>
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<td>Music by Frank Farley and Sons</td>
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</tbody>
</table>
ABSTRACTS

ORAL PRESENTATIONS

Monday, JUNE 6, 2016

SYMPOSIUM 01: Appalachian Mountain Cultures and Plants

Marietta, Geoff  
director@pinemountainsettlementschool.com  
Pine Mountain Settlement School, 36 Highway 510, Bledsoe, KY, 40810, USA

Resilience, Resources, and Regeneration: Welcome to Future of Pine Mountain Settlement School

With the sharp decline of coal over the past three years, there is a pressing need to transition coal-producing counties in Appalachia to a diversified and sustainable economy. Pine Mountain Settlement School, a 501(c)3 non-profit, is positioned to take on this challenge after 100 years of serving the coalfield counties. A National Historic Landmark, Pine Mountain Settlement School was founded in 1913 as a boarding school for children in Kentucky's remote southeastern mountains. The School was the dream of a local man, William Creech Sr., who was troubled by the area's lack of educational opportunities and the prevalence of social problems and rampant disease. The problems facing the region then are much the same today, and Pine Mountain Settlement School is returning to its roots to serve as a leader in the economic and social transition in Appalachia. Our mission is to enrich lives and connect people through Appalachian place-based education for all ages. We carry out that mission through core activities in education, sustainability, and economic development. In this welcome presentation for the Annual Meeting of the Society for Economic Botany, I will first give a brief overview of the history of Pine Mountain Settlement School within the context of Harlan County, Eastern Kentucky, and Central Appalachia. I then discuss the geological and ecological aspects of the area that produce astounding biodiversity. In conclusion, I focus on how the history and ecology of the area shape a unique and resilient people who are primed for a future economy that is sustainable, diversified, and built on natural and cultural strengths of the region.

Key words: Economic Development, Sustainability, Resilience, Biodiversity

Thompson, Ralph  
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Berea College, Biology, Berea, KY, 40403, USA

A Vascular Flora of Pine Mountain Settlement School and James E. Bickford State Nature Preserve, Harlan County, Kentucky

Pine Mountain Settlement School is a rugged 298 ha mountain area from 530 m to 823 m elevation in extreme northern Harlan County in southeastern Kentucky. PMSS was founded in 1913 as a school for mountain youth and it has served as an environmental education center since 1972. PMSS is situated within the Pine Mountain Overthrust Fault of the Cumberland Mountain Thrust Block Ecoregion in the Eastern Kentucky Coal Field Physiographic Region. Bedrock lithology consists of shale, siltstone, conglomerate, sandstone, and coal of the Lower and Middle Pennsylvanian Series. Mountain colluvial and residual soils are well drained with loamy subsoils on steep south and very steep north mountain slopes. A preliminary floristic study of PMSS was conducted during 1987, 1988, 1997, 1998, and 2014 that included the James E. Bickford State Nature Preserve (BSNP), a 141 ha mountain tract on the north face of PMSS. BSNP was dedicated in 2003 by the Kentucky State Nature Preserves Commission to preserve an old-growth stand of Mixed Mesophytic Forest. E. Lucy Braun, the famous American plant ecologist on the Deciduous Forest of eastern North America, studied the Mixed Mesophytic Forest of the Cumberland Mountains during the demise of the American Chestnut by the Chestnut Blight during the
1930s-1950s. She designated the Cumberland Mountains as the richest center of the Mixed Mesophytic Forest where many rare species existed and several canopy tree species shared dominance. A preliminary PMSS flora consists of 738 taxa from 422 genera in 128 families. A total of 575 are native and 163 non-native. Non-natives constitute 30 introduced and 133 naturalized; 74 taxa are invasive. Fourteen native taxa are planted. BSNP is comprised of 481 taxa (65.2% of PMSS flora) in 297 genera from 111 families; 14 are invasive. BSNP has at least 12 state-listed endangered, threatened, or special concern plant species.

Evans, Marc [1], Abernathy, Greg [1], Archer, Hugh [1] gabenathy@knlt.org
Kentucky Natural Lands Trust, 433 Chestnut St, Berea, KY, 40403, US

Pine Mountain Wildlands Corridor, an Ecological Treasure and the Largest Conservation Project in Kentucky's History

An overview of the ecological significance, flora, fauna and natural communities of Pine Mountain is presented. The Kentucky Natural Lands Trust (KNLT) protection efforts of the Pine Mountain Wildlands Corridor is also discussed. Pine Mountain is a 125-mile long mountain ridge that runs southwest to northeast from Tennessee through extreme southeast Kentucky to Virginia. Pine Mountain is the western flank of the Cumberland mountains thrust fault block, a subregion of the Central Appalachian mountains. The highest elevation is 3,300 feet asl with a maximum elevation gain of approximately 1,500 feet. The central Appalachians are known for their rich diversity of flora and fauna and Pine Mountain exemplifies this. Over 10 terrestrial ecological communities are known from the mountain as well as wetland, subterranean and aquatic communities. Rich, mixed Appalachian mesophytic forest, Hemlock-mixed forest, Appalachian pine-oak forest and Xeric Virginia pine forest/woodland dominate the mountain. Mountain bogs, large rock outcrops, caves and high gradient mountain streams also occur. Nearly 100 species of rare plants and animals are documented as living on the mountain; including 5 federally listed species, 2 candidates for federally listing and 90 state listed species. KNLT, a non-profit conservation organization, was formed in 1995 to help protect Blanton Forest on Pine Mountain. At 2,300 acres, it is the largest known tract of old growth forest in the state. After successfully protecting Blanton Forest, KNLT made the decision to think big and to protect the entire Pine Mountain ridge which is a critical refuge and migratory route that is part of a major corridor through Eastern North America. Pine Mountain also runs through an area that has had extensive surface coal mining that has impacted and fragmented the surrounding habitat making Pine Mountain even more significant.

Key Words: Pine Mountain, wildlands, corridor, rare species

Smith, Ada
Appalshop, Inc., 91 Madison Ave., Whitesburg, KY, 41858, USA

Ethnographic Media from Appalachia

Started in 1969 as a federal War on Poverty job training program for youth/young adults in film and video, Appalshop morphed into a ways and means for connecting media and other arts with the region's cultural traditions and expressions in order to tell the Appalachian story through the voices and experiences of its people. Deeply rooted in its place, Appalshop has since created the largest single body of media and artwork from and about Appalachia. This work represents a populist call and response between the region’s past, present, and future, as it celebrates its Appalachian heritage while confronting its most challenging issues, including a poisonous history of negative stereotypes. In addition to its regional work, Appalshop artists, producers, and managers have collaborated with more than a thousand communities across the United States (and in more than a half-dozen countries internationally) wishing to develop their own cultural assets. Its collections of documentary films, plays, spoken word and music recordings, books, and photography illuminate people and their cultures as the most valuable asset to advance development, wealth, and freedom. During this symposium, we will watch and hear Appalshop media while learning more about its involvement in the region's future.
**SYMPOSIUM 02: People and Plants: Cultural Ethnobotany**

**Merlin, Mark D**  
merlin@hawaii.edu  
University of Hawaii at Manoa, Botany, Department of Botany, 3190 Maile Way, Honolulu, HI, 96822, USA

**Kentucky Hemp: Entwined in Slavery, Sharecropping and Profits for the Elite (1775-1937)**

As the American Revolutionary War (1771-1781) progressed, imported hemp (Cannabis sativa) became costly. This encouraged domestic production of this fiber crop in the colonies. In 1775, Cannabis seeds for fiber cultivation were introduced into Kentucky, which would develop into the center of the U.S. hemp industry. However, Russian hemp continued to supply the majority of hemp fiber for America’s needs. As Kentucky hemp eventually achieved commercial success, it contributed to the cotton industry. Kentucky produced only small amounts of cotton, but its antebellum economy depended upon sales of hempen baling twine, sacks and ropes to cotton growers. Labor and health issues surrounding malodourous Cannabis pond retting limited the quality of hemp fiber production. Immersion of the fibrous stalks in standing water was a dangerous, loathsome task because of the supposedly infectious air generated from the putrefying stalks. Consequently, American-made hemp was characterized as low-strength, dew-retted fiber that was inferior to Russian hemp. Slave labor in Kentucky provided the repugnant economic means by which the hemp farmers could compete with cheaper and superior quality Russian hemp. Emancipation of the slaves in the U.S., along with changing technology and the end of U.S. government subsidization of hemp farming, turned the tide of the Kentucky hemp business. Nationwide, this agricultural fiber industry, including the large contingent of hemp farmers in Kentucky, generally shifted to other crops such as tobacco. As a result, hemp cultivation dwindled in Kentucky, with only sharecroppers and poor independent farmers continuing to grow hemp for sale until full prohibition of Cannabis ensued by 1937. Ethnobotanical, ecological, economic and social issues related to this historic phase of hemp cultivation in the New World are discussed in this paper.

**Keywords:** Kentucky, hemp, Cannabis, slavery

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bennett@fiu.edu  
Florida International University, Department of Biological Sciences, 11200 SW 8th St., Miami, FL, 33199, USA

**Science in Fiction: “The Yearling” and Ethnobotany in Northern Florida**

Ethnobotanical data arises from many sources but one, the historical novel, is largely untapped. It would appear to be an unlikely source. Novels are works of fiction, science deals with facts. Yet, the difference are not absolute. Sir William Cecil Dampier (1943) recognized the importance of other disciplines in understanding nature: to see life steadily and to see it whole we need not only science, but ethics, art and philosophy. The genre of “science-in-fiction”—fiction that portrays science and scientist in a realistic manner, attempts to bridge the chasm between science and literature. Here, I consider, ethnobotany in fiction as the incorporation of ethnobotanical data into fiction, sometimes including data not available in scientific publications. Ethnobotanical references abound in literature, from Milton’s *Paradise Lost* to J.K Rowling’s *Harry Potter*. Plants play a more central role in Vargas Llosa’s (1989) *The Story Teller*, Marjorie Kinnan Rawlings *The Yearling* stands out as a source of ethnobotanical lore. Almost every one of the novel’s 428 pages includes references to a plant or a plant product. Her accounts, based on personal experience and interviews with locals, describe many ethnobotanical applications not previously documented. My proximate objective is to describe late 19th century pioneer plant use in northern Florida, as portrayed in *The Yearling*, I address three questions: What useful plants and plant products are explicitly cited in *The Yearling*? What plants and plant products are implied in the novel? Are their depictions accurate? My ultimate goal is to evaluate an innovative source of ethnobotanical data that captures information not available in ethnobotanical literature or the archaeological record. *The Yearling*’s 3,911 direct and indirect references to useful plants and plant product justifies its classification as an “ethnobotanical novel.”

**Keywords:** ethnobotany, northern Florida, Marjorie Kinnan Rawlings, *The Yearling*
Bridges, Kim [1], McClatchey, Will [2], kim@hawaii.edu 1 - University of Hawai`i at Manoa, Botany Department, Honolulu, HI, 96822, USA, 2 - Thousand Arbor Refuge, 28281 Hamm Road, Eugene, OR, 97405, USA

The Science of Survival: An Unexpected Example
Many plant species found in nature have what we would call “plain” flowers. These are flowers that don't draw our attention. These flowers, to a casual glance, are all the same. In the hands of a plant breeder, however, small differences in color, size and structure are discovered and amplified. Eventually, plants of this species may show a very wide range of characteristics, most of which are attractive for social or commercial use. Such a species is then guaranteed a successful future. Or is it? What adaptive strategies can be used to preserve the efforts of the plant breeder when a species loses its popularity? This study compares historical and modern data in the context of industrialized nations. This research setting also challenges the application of our ethical standards of sharing with people who help us.

Keywords: Survival, Selection, Ethics, Adaptation

Savo, Valentina [1], Bailey, Joseph [2], Kohfeld, Karen [2], Sillmann, Jana [3], Lepofsky, Dana [4]. vsavo@sfu.ca
1 - Simon Fraser University, Hakai Institute; Department of Archeology, 8888 University Drive, Burnaby, BC, V5A1S6, Canada
2 - Simon Fraser University, School of Resource and Environmental Management, 8888 University Drive, Burnaby, BC, V5A1S6, Canada
3 - Center for International Climate and Environmental Research – Oslo, Pb. 1129 Blindern, Oslo, N-0318, Norway
4 - Simon Fraser University, Department of Archeology, 8888 University Drive, Burnaby, BC, V5A1S6, Canada

Local Observations of Rainfall Changes
Climate change is a global problem with complex impacts on ecosystems and societies. The livelihoods of many communities that rely on local environments for their food and culture depend on predictable cycles of rains and seasons. We collated the observations by subsistence-oriented communities of climate change at the global level from more than 1000 studies. These communities are observing multiple changes in precipitation regimes, including enhanced drought and more extreme precipitation events. These have detrimental impacts on agriculture and other subsistence activities. Our comparison shows impressive matches between human observations and instrumental measures that inform global assessments of changes in drought and extreme rainfall. However, some observed changes are not well captured by rainfall metrics and provide new insights on how regional rainfall changes are affecting communities. Some changes, such as disruptions to the seasonal cycles of rainfall, are of great concern for local communities but are yet not well studied. Our results show that climate change is having more disruptive effects at a local level than is highlighted by scientific research on climate and that local observations can make important contributions to understanding how climate change is affecting the lives of many subsistence-oriented communities.

Keywords: Climate Change, Rainfall, Food, Agriculture, Subsistence-oriented communities, Global analysis

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Florida Atlantic University, Geosciences, 777 Glades Rd, Boca Raton, Florida, 33431, United States

Kauri (Agathis australis) Ethnobotany: Identity, Conservation and Connection in New Zealand
The Kauri tree Agathis australis (Araucariaceae), one of the largest trees in the world, is often compared in size and grandeur to the west coast redwoods. The species grows mostly on the north island of New Zealand. Plants play a large role in New Zealand identity. However, the kauri tree earns a different level of awareness and respect from both locals and foreigners. Tourists travel from throughout the globe to
view one of the largest individuals, Tane Mahuta “The God of the Forest.” This paper explores the role that the Kauri tree plays in the current local ethnobotany of New Zealand, looking at the importance in relation to the theories regarding attachment to place through spiritual connection to the landscape. Historically the species was most often used for timber and resin, while also being a revered presence in the forest. Using case studies of ethnically diverse individuals, this project investigates how Maori and non-Maori interact with this species. While deforestation and Kauri dieback disease threaten this flora, the majority of research and conservation focus on the most famous individual trees. This paper looks at those less renowned forest stands and their importance for local people. This human connection to local Kauri can foster preservation of the tree and the environments in which it grows.

**Keywords:** Kauri, New Zealand, *Agathis australis*, Maori

**Brosi, Sunshine** slbrosi@frostburg.edu
Frostburg State University, Biology, 101 Braddock Road, Frostburg, MD, 21532, USA

**Lucy Braun’s Plants and Places**
Sunshine Brosi will connect the work of Lucy Braun with the ecosystems you will experience on your walks around Pine Mountain. Dr. Braun produced over 180 publications including four books and publishing in twenty different scientific & popular journals. She wrote the first definitive text “Deciduous Forests of Eastern North America” and the first scientific paper of change in flora over time. She described four new species to science including the whitehair goldenrod *Solidago albopilosa* (1942), Braun’s rockeress *Boechera perstellata* (1939), Lucy Braun’s white snakeroot *Ageratina luciae-brauniae* (1941), and Cumberland azalea *Rhododendron cumberlandense* (1941). Dr. Braun wrote numerous range, morphology and ecology papers. The checklist of spermatophytes of Kentucky has been used for decades. Dr. Braun collected 11,891 herbarium specimens.

**SYMPOSIUM 03: FULLING CONTESTANTS**

**Burton, Tristesse** [1], Dunlap, Tareisha [1], Dong, Huali [3], Li, Guannan [3], Bolton, Judy [3], Soejarto, Djaia [3], van Breemen, Richard [3]. jones.tristesse@gmail.com

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2 - University of Illinois at Chicago, UIC/NIH Center for Botanical Dietar, Department of Medicinal Chemistry and Pharmacognosy, 833 South Wood Street, Chicago, IL, 60612, USA
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5 - University of Illinois at Chicago, UIC/NIH Center for Botanical Dietar, Medicinal Chemistry and Pharmacognosy, 833 South Wood Street, Chicago, IL, 60612, USA
6 - University of Illinois at Chicago, UIC/NIH Center for Botanical Dietar, Medicinal Chemistry and Pharmacognosy, 833 South Wood Street, Chicago, IL, 60612, USA
7 - University of Illinois at Chicago, UIC/NIH Center for Botanical Dietar, Medicinal Chemistry and Pharmacognosy, 833 South Wood Street, Chicago, IL, 60612, USA

**American Indian Botanicals as Possible Alternatives to Hormone Therapy during Menopause**
Although pharmaceutical hormone therapy (HT) remains the standard clinical treatment for managing menopausal symptoms, many women seek alternatives such as botanical dietary supplements because HT has been associated with increased risks of breast cancer, coronary heart disease and stroke. The leading botanicals that women take for menopause are black cohosh and red clover, which were also traditionally used by American Indian women. While these two botanicals have been investigated extensively, there
are still numerous American Indian plants that lack scientific studies on their safety and efficacy and current ethnobotanical relevance. In collaboration with the Chicago Botanic Garden, 15 Illinois-native plants were evaluated for potential women's health-related benefits. Out of the 15 species, *Amorpha canescens*; Pursh. (Fabaceae) - leadplant, *Echinocystis lobata* (Michx.) Torr. & A. Gray (Cucurbitaceae) - wild cucumber, and *Silphium perfoliatum* L. (Asteraceae); cup plant; inflorescent tissue were screened for estrogenicity, chemopreventive, and anti-inflammatory potential based on previously published American Indian ethnobotany and biological data. Leadplants. MeOH extract was selected as the best candidate for bioassay-guided fractionation due to dose-dependent (40, 20, 10, 5, 2.5, 1.25 micro g/mL) anti-estrogenic and anti-inflammatory activity in the Ishikawa and Griess assays (n=9). Cup plant, *Lespedeza capitata* Mixch. (Fabaceae) roundhead lespedeza (chosen from the remaining 12 species) will be pursued as alternatives. Currently, bioassay guided-fractionation is being performed on leadplants MeOH extract to ascertain the active constituents. Also, ethnobotanical studies will be performed with American Indian women in the Chicago region to identify current medicinal uses for the investigated plants.

**Keywords**: American Indian ethnobotany, menopause, phytoestrogen

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**Toward an industrial ethnobotany: Social dynamics of plant use in green infrastructure**

The growing popularity of green infrastructure is changing the dynamics of urban ecosystems. A developing research project seeks to explore what the implications of these changes mean within both ecological and social contexts. For this study, we will examine the green wall industry in particular, and use surveys and semi-structured interviews with green wall professionals to identify challenges to this developing industry as well as the environmental co-benefits provided by green walls. Variably termed living walls or vertical gardens, these structures are recognized for contributions to mitigation of urban heat island effect and the reduction of air and noise pollution in urban settings, and are currently being investigated for additional benefits such as storm water runoff mitigation and active heat rejection. Green walls provide an interesting case study, in that plants are used as elements of construction, and act simultaneously as functional and aesthetic elements while providing a sense of nature; within urban ecosystems. Plant selection for green walls is made within a complex matrix of priorities and values, the interplay of which both shapes and is shaped by human actors within urban ecosystems.

**Keywords**: ethnobotany, green infrastructure, green walls, urban ecology, urban ethnobotany

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**Ethnobotanical Implications of Stress-Induced Alkaloid Production in Medicinal Plants**

The Madagascar periwinkle (*Catharanthus roseus*) produces over 100 alkaloids, many of which show activity against cancers and other diseases. These specialized metabolites are one very important way that the plant protects itself from predators, microbes, and other competitors. In this study, we investigate the alkaloid profile of in vitro tissue cultures that have been elicited with a plant defense hormone in order to increase and diversify biosynthesis. Their alkaloid profiles, including at least one previously uncharacterized metabolite, are compared and characterized by MS/MS. A comparison of the alkaloid profiles from *C. roseus* native roots, untreated, and elicited hairy root lines suggests that elicitation with the plant defense hormone, methyl jasmonate, uniquely altered alkaloid biosynthesis by diverting the metabolic pathway.

**Keywords**: medicinal plant, pharmacognosy
Feinberg, Termeh [1], Lilly, Christa [2], Innes, Kim (Karen) [1], termehmph@me.com
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2 - West Virginia University School of Public Health, Biostatistics, 5 Medical Drive, Morgantown, WV, 26506, USA

Correlates of Herbal use for Pain Management in an Appalachian Chronic Pain Population
Background: Herbs indicated for analgesia and rheumatic conditions have traditionally been used in Appalachia. However, determinants and patterns of herbal use with regard to pain management have not been well studied, particularly in West Virginia. In this cross-sectional study, we investigated the relation of herbal use to a variety of factors in Appalachian chronic pain patients. Methods: Participants were 293 adult chronic pain patients (18+) recruited using convenience sampling in four West Virginia pain and rheumatology clinics. All participants completed the Complementary Health Approaches for Pain Survey (CHAPS)(2014-2016); demographic, lifestyle, and health factors were measured, including current and potential future use of herbs, 11 other Complementary Health Approaches (CHAs), and pain severity (Short-Form Global Pain Scale (SF-GPS)). Logistic and linear regression were used to identify correlates of herbal use among participants with current chronic pain (n = 219). Results: 10.1% of participants reported using herbs for pain management;19 herbs were reported. Herbal use was positively associated with intention to use other CHAs in the next 30 days and 6 months (odds ratio (OR)=3.5 (CI 1.3,10.1) and OR=4.2 (CI 1.7,10.4), respectively), and with the current use of other CHAs for both the past 6 months and beyond 6 months (OR=3.0 (CI 1.2,7.2) and OR=2.6 (CI 1.0,6.7)). Those with asthma or musculoskeletal/tissue injury were also more likely to use herbs for pain (OR=2.9 (CI 1.1,7.7) and OR=3.3 (CI 1.3,8.1)). There was no difference in SF-GPS score by herbal use status (p = 0.17). Conclusions: Findings from this study indicate a significant positive association of herbal use to the use of other CHAs and selected comorbid conditions. Further prospective research is needed to confirm these findings and to investigate the reported efficacy of herbs used for pain.

Keywords: Phytotherapy, Herbal Medicine, Traditional Medicine, Integrative Medicine, Chronic Pain, Analgesia, Rheumatic Diseases, Epidemiology, Comorbidity, Surveys and Questionnaires, Appalachian Region, Complementary Health Approaches

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Reproductions of colourful Iron Age bands from the salt mine of Hallstatt: an interdisciplinary approach to acquire knowledge of the dyeing technology of the Hallstatt Culture in central Europe
Textiles from the Bronze Age and Iron Age have been preserved for more than 3000 years in the salt mine of Hallstatt in Austria. Copper originating from prehistoric mining tools made of bronze has probably altered the colour of many of the textiles. Three woven bands from the Iron Age were chosen for reproductions in order to show how they might originally have looked, and to acquire knowledge of the dyeing technology of the people of the Hallstatt Culture. As there are no written sources of this time, dyeing techniques documented in historical, ethnographic, and experimental archaeological literature...
were analysed. Fibre, dye and element analyses of the prehistoric bands formed the basis for the experimental development of dyeing methods using woad (*Isatis tinctoria* L.), weld (*Reseda luteola* L.) and scentless chamomile (*Tripleurospermum inodorum*; (L.) Sch. Bip.). The hand spun yarns were woven with rep band and tablet weaving techniques. Each band was successfully reconstructed in two possible colour variants. The light fastness of the dyed woollen yarns ranges between level 3 and 6 and matches everyday requirements today. Element and dye analyses and a post-mordanting experiment with copper acetate explain todays colours of the woven bands. A detailed picture of conceivable dyeing techniques of the people of the Hallstatt Culture is provided. Dyeing with natural dyes is an ancient cultural technology that is simple in terms of equipment and resources, but sophisticated in terms of the technical knowledge required. It fully reflects the comprehensive knowledge prehistoric people had of the chemical properties of natural substances, the effect of temperature on (bio)chemical processes, and the ability to control and manage these processes. In central Europe, the beginning of this knowledge dates back to Bronze Age, the 2nd millennium BC, as proven by the textile finds in Hallstatt.

**Keywords**: natural dye, Hallstatt Culture, archaeological textile, reproduction, experiment, dye analysis, HPLC-PDA, SEM-EDX

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**Interdisciplinary Approaches to Interpreting Nontimber Forest Product Harvest Distributions in Appalachia**

Harvesting medicinal plants has a long history in Appalachian forests, and today the practice remains a source of income, identity and sense of place within Appalachian communities. Assessing the economic value of non-timber forest products (NTFPs), the size and structure of their markets and the impact of harvests on plant populations is difficult due to a lack of systematically collected region-wide data. An ongoing study at Virginia Tech seeks to create a voluntary, replicable mechanism for estimating the variety, trade volume and origin of commercially traded Appalachian NTFP species. Initial results show that harvest is concentrated in certain areas within the plants’ ranges. We identified a number of explanations for why plants may be harvested more in some areas than others from conversations with medicinal plant buyers and from NTFP literature. These include the presence of plant habitat, economic instability, an established tradition of wildcrafting, the genealogy of the industry, land ownership, land access and the prevalence of certain land uses such as agriculture, tourism and extractive industries such as logging and coal mining. We created variables to represent these explanations and correlated them with harvest distribution data from the survey. Biophysical, socio-economic and political realities all influence commercial NTFP harvests differently throughout what is often considered a homogenous region. Understanding how intersecting local and extralocal conditions affect harvesting practices can help target efforts at cultivation, conservation and management for these important species and help identify potential barriers for participation, barriers often built on nuanced personal experiences of the same
forces. This is especially relevant as the economy of much of the region changes and with it the future of land use and land ownership.

**Keywords:** Appalachia, medicinal plants, Extractive Industry, forest farming, Commons, Nontimber Forest Products, Human Geography

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**Evaluation of antimicrobial activity, toxicity, phytochemical screening of selected medicinal plants of Losho, Narok county, Kenya**

In Kenya, microbial infections are a major cause of morbidity. Antibiotic effectiveness is threatened by increasing resistance of pathogenic microbes against most available drugs as new pathogens continue to emerge. Currently, herbal remedies offer hope considering they are readily and cheaply available. This study focused on antimicrobial activity, brine shrimp lethality and phytochemical composition of crude extracts of *Schrebera alata*, *Ormocarpum kirkii*, *Helichrysum forskahlii*; and *Cussonia holstii*; that are medicinally used by herbalists from Losho for treatment of ear, nose and throat infections, gastrointestinal disorders and skin ailments. Qualitative AST against five microorganisms, methicillin resistant *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Candida albicans* was investigated using agar diffusion methods to generate inhibition zones and MIC values. Toxicity of the extracts was investigated using BSL assay to determine median LC50. Phytochemical screening was determined using standard procedures. Organic crude extracts of *H. forskahlii* had the highest inhibition zone against methicillin resistant *Staphylococcus aureus* of 19.5 and 18.5 mm in agar well and agar disk diffusion respectively. MIC values varied from 15.625 to 250mg/ml. Organic crude extracts of *H. forskahlii* and *C. holstii* were found to be highly toxic (LC50 -0.009 mg/ml). All the plant crude extracts contained flavanoids, sterols, alkaloids, tannins, quinones and terpenoids. Saponins were present in all the plant extracts screened except organic extracts of *H. forskahlii*. The study has shown that *H. forskahlii* and *O. kirkii* possess promising antimicrobial activity against microbes of health importance and could lead to the isolation of novel, safe and efficacious antimicrobial compounds and further research should be carried to isolate and characterize the compounds responsible for the observed activity.

**Keywords:** antimicrobial plants, Kenya, toxicity, Phytochemical screening

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**Fish-to-School Community-based process for strengthening local food systems in Western Alaska**

Fish-to-School was a one year demonstration project and research study that took place in Western Alaska in 2012 and 2013. The project aimed to improve dietary quality in youth by serving local salmon in the school lunches, teaching food system-related lessons in the classroom, and holding community events. As a health promotion project focused on local, culturally important foods in indigenous communities, it was necessary to first understand local perceptions and values connected to these foods. Formative research conducted in the Western Alaskan community explored the connection between salmon and well-being in order to design a cultural food project. Ongoing collaboration between academic and community partners informed the development of the final intervention design using the formative research findings. This paper will share the process of designing and implementing this project based on local meanings and values of salmon to improve dietary quality among youth in an Alaska Native community. A Y-centered approach set the foundation for a mutually beneficial partnership between researchers and community members. The presentation will describe the challenges and strengths of developing this process and discuss the implications of a culture-centered approach that coordinates community-ownership of the research process as a long-term strategy to promote health.
among indigenous youth. Selected pieces of the Fish-to-School toolkit will be shared as an example for how to promote culturally important foods in indigenous communities undergoing nutrition transition. 

Keywords: food security, food sovereignty, nutrition transition, Vision and Change, health promotion, community-centered design

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Geospatial Analysis of Pest Vulnerability in Street Trees in the District of Columbia

Urban forests are particularly at risk for biological stressors, such as insect pests and exotic diseases, because of diminished health caused by the abiotic stressors including compaction, nutrient deficiency, salinity, and pollution. Urban forests can be evaluated using tools such as the Pest Vulnerability Matrix (PVM), which assigns a numeric vulnerability score based on relative overall abundance of species/genera and their individuals risks of infestation or infection. Another approach is to evaluate biodiversity and species evenness using a biodiversity index. Our project incorporates spatial analysis with the above mentioned forest health parameters within the District of Columbia (D.C.). We explored PVM and diversity across specific management units to create a list of species to avoid in future plantings and suggestions of species to plant in order to achieve a more even species composition and lower PVM. We also used census data to look for a relationship between street tree species diversity and social factors such as household income. A relationship termed “the luxury effect,” where higher species diversity is present in wealthier areas within a city, has been described in other urban forests. Results show that the overall Pest Vulnerability Matrix score for D.C. was 11.88 and varied only across Wards from 10.89 - 12.90. There was not a simple, linear relationship between pest vulnerability and biodiversity; some more diverse wards received high PVM scores based on the disproportionate percentage of high risk species. It is not only necessary to consider insulating with tree diversity, but to also utilize low risk families, genera, and species. In contrasts to other cities we found no significant relationship between household income and other measure of socioeconomic status and street tree diversity and pest vulnerability

Keywords: Urban Forestry, biological diversity, eco-equity, pest vulnerability

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Fruit Trade in Loreto, Peru: Market Drivers for Extraction and Potential for Conservation Interventions

This research describes the regional market chain of *Mauritia flexuosa* fruit in the northeastern Peruvian Amazon within the context of identifying market drivers and potential for conservation interventions. *M. flexuosa* is a long-lived dioecious palm that grows to 30 meters in height and forms expansive palm swamps that cover 10% of the Peruvian Amazon. This palm provides critical habitat and food for many wildlife species. The fruit harvest has widespread ecological concerns as the most common method is to cut down female trees, which has resulted in many male dominated stands. Rural communities throughout the Peruvian Amazon harvest *M. flexuosa* fruit to be sold in the largest city in the region, Iquitos. This species is the target of conservation and management initiatives and understanding the complex interactions of the market chain are important for designing effective and sustainable interventions.
Through over 1,000 semi-structured interviews with individuals representing every aspect of the market chain, extraction motivation and distribution patterns are described. We estimate that over 90% of the aguaje sold in Iquitos is harvested by cutting instead of more sustainable methods such as climbing. We identify intermediary wholesalers as major market forces for harvest who retain power by controlling market access and transportation of goods. Non-timber forest products (NTFPs) such as M. flexuosa fruit are often promoted as a means for sustainably providing income to rural families in developing nations yet our findings question this assertion. In addition to the obvious long-term sustainability concerns surrounding the destructive harvest, our findings also suggest that for this species most revenue goes to a small group of intermediary sellers controlling the bulk of market flow. This study highlights the need to address market access, flow, and fluctuations as well as harvest method as part of a holistic conservation and management strategy for the species.

**Keywords:** *Mauritia flexuosa*, aguaje, conservation, Peruvian Amazon

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**Unraveling the Mysteries of Ibervillea sonorae, a Phenom of Mexican Traditional Medicine**

The surge of diabetes in Mexico and people of ancestry from the Americas is particularly widespread. In this same scenario, traditional and herbal medicine use by Mexicans is particularly strong. Here, one phenom of herbal medicine is the caudex of *Ibervillea sonorae* (S. Watson) Greene, Cucurbitaceae, has rose to prominence as a supplement with hypoglycemic properties. In this study we examine the hypothesis that traditional knowledge can guide our understanding of medicinal plant mechanisms. Further, we hypothesized that *Ibervillea sonorae* (S. Watson) Greene acts through pathways currently employed to treat diabetes. Healer and shopkeeper interviews revealed prescriptions similar to those for the alpha-glucosidase inhibitor, acarbose. Inhibition studies revealed dose dependent, and competitive inhibition of alpha-glucosidase by aqueous *I. sonorae* extract. Further, aqueous extract stimulated insulin secretion from RINm5F pancreatic beta-cells. Taken together, these results display the role of ethnobotanical fieldwork in identifying mechanisms of local remedies. Understanding these mechanisms supports patient care by identifying the mechanism of this popular supplement so physicians can avoid contraindications. It also shows the value of continued pharmacological studies on this species.

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**Stocking the Hunting Ground: Insights Into the Supply of Wild Ginseng (Panax quinquefolius L.) From Pennsylvania, U.S.A., and Implications Regarding Industry Tracking of an Important Internal**

Pennsylvania is one of nineteen states in the United States of America (U.S.A.) that exports wild American ginseng (*Panax quinquefolius L.*) roots into the international marketplace under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) treaty. Given concerns over the sustainability of this centuries old trade, there is an urgent need to better understand the wild supply chain along with any husbandry involved in the production of exported roots. Since 2012, we have been employing an ethnobotanical approach to gather confidential insight into wild ginseng supplies from Pennsylvania via an annual survey instrument mailed to people involved in the sale of wild ginseng
(gathered from licensed buyer transaction logs). Results indicate that a variety of husbandry practices are used to produce ginseng which ultimately is sold and traded as wild; ranging from intensive agroforestry (e.g., forest farming) to enrichment plantings (e.g., stocking of collection areas). Results obtained between 2012 and 2015 revealed that 23% to 57% of sellers participating in this survey effort indicated that their wild ginseng originated from intentional planting on forestlands. This scenario presents a dilemma regarding interpretation of wild harvest data because current industry reporting mechanisms are inadequate to accommodate the complex range of husbandry practices being utilized, and which often result in wild appearing roots. Moreover, producer concerns and misgivings about issues such as price gouging, theft, taxation coupled with a lack of consensus around what actually constitutes wild continues to drive secrecy around forest based husbandry and cultivation practices. These results suggest that changes in transaction reporting paperwork alone will not effectively bring clarity to supply origins. We suggest that annual confidential surveying of root sellers could serve as an important tool to help inform state and federal ginseng conservation and management programs.

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Utilization and conservation of a hardwood medical forest species: Xerospermum noronhianum (Sapindaceae)

Xerospermum noronhianum (Blume), locally known as (leechs longan) is a multipurpose fruit tree species of high economic importance, native to the limestone forests of Vietnam. This species along with lychee (Litchi chinensis Sonn) belong to the Sapindaceae family. The fruits of X. noronhianum are edible, with a sweet and pleasant taste, resembling those of Nephellium lappaceum, another Sapindaceae species that yields the commercially important Rambutan tropical fruit. The fruit of X. noronhianum is too small to be of any commercial value, but the species is a source of medicines against diarrhea, stomach pains and Alzheimer disease. Recently, has emerged as a high-priority species for domestication in Vietnam after a national survey and ranking of non-timber forest products. Information on the level of genetic variation and the extent of genetic diversity within and between natural and managed populations is needed to develop strategies for domestication. We investigated the transferability of 14 lychee (L. chinensis) Simple Sequence Repeat (SSR) loci to (X. noronhianum). Ten primer pairs were found to be transferable (71.4%), whereas seven revealed polymorphisms (70%). The average number of alleles per locus has dropped from 6.1 for lychee to 4.7 for. The loci were polymorphic in 110 individuals from 5 populations in Vietnam, with 2 to 10 alleles per locus and observed heterozygosity ranging from 0.14 to 0.76. The relatively high frequency of cross-transferability observed in this study is rather unexpected belongs to the Sapindoideae subfamily, while lychee, pulasan, and longan belong to subfamily Nepheleae and are, therefore, more closely related. However, this study showed that the SSR markers developed in lychee are a good source of molecular markers for X. noronhianum.

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Antibacterial Activity of Medicinal Plants from The Physicians of Myddvai 3rd Century Welsh Medical Text

Reports of traditional Celtic plant medicine date back to Roman times, however a major barrier for successful integration of these remedies into mainstream practice is the current lack of accurate interpretation and scientific validation. Based on a translation of the 13th century Welsh medical text recorded by the Physicians of Myddvai, a list of 165 plants used historically for treating infections likely
caused by microbial pathogens was compiled. Fresh plant samples of 107 species from this list (95 genera, 46 families, and 27 taxonomic orders) were collected during a 2 month field trip to the Isle of Arran, Scotland, and analyzed for antimicrobial activity using mobile biodiscovery kits with human saliva as a source of bacteria for screening. From those plants, 67 species (62.6%) were found to have detectable levels of antimicrobial activity. The families Asteraceae, Amaryllidaceae, Apiaceae, Brassicaceae, Lamiaceae, and Rosaceae collectively contributed 42 species with antibacterial properties, highlighting their critical importance to Celtic herbal medicine. In a follow-up proof-of-concept study, bioassay-guided fractionation was performed, yielding antimicrobial constituents from one of the high scoring hits (juniper “berries,” Juniperus communis L.) Quantitative analysis showed both hexane and ethyl acetate fractions to have a strong antibacterial activity against a gram-positive Staphylococcus aureus, while only the hexane fraction effectively inhibited growth of a gram-negative Escherichia coli. Sabine, a natural bicyclic monoterpen from “juniper berries,” showed the highest antimicrobial activity with MIC values in the range of 58-215μg/ml, thus validating traditional Celtic medicinal plant knowledge and the mobile biodiscovery screening approach. Using historical medical sources such as those associated with traditional Celtic medicine to guide rigorous, evidence-based scientific pharmacognosy therefore provides additional natural sources of new and alternative bioactive molecules for combating bacterial and infectious diseases, as well as inevitable antimicrobial resistance.

Keywords: Celtic ethnobotany, antimicrobial plants

SYMPOSIUM 04: CONSERVATION ETHNOBIOLOGY
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Sanctuary Networks for Medicinal Plant Conservation

For centuries, traditional healers have used medicinal plants. In addition, it is recognized that custodians of sacred natural sites hold knowledge about the botanical resources of these natural areas. Many sacred sites contain medicinal plants not found elsewhere. In order for these important plants to survive for future generations, it is critical that they are conserved now. This could be through on-site (in situ) conservation, or off-site (ex situ) cultivation at botanical gardens or home gardens. It is critical that the keepers of the medicinal plant knowledge are respected and that as plants are harvested, it is done in a sustainable manner, with permission of landowners. To preserve biodiversity and plant knowledge, the Botanical Sanctuaries and Sacred Seeds Sanctuary networks were formed. These community-based initiatives are networks of individual and community gardens. The networks provide support for the conservation of medicinal plants through publicity, natural resource management advice, and training opportunities. The Botanical Sanctuaries Network was established in 2000 and currently consists of 111 sanctuary gardens across the United States and Canada. The Sacred Seeds Sanctuary network is a global program of over 30 gardens. This presentation will provide examples of botanical sanctuaries within the networks, the results of a 2015 sanctuary network workshop, and success stories from sanctuaries.

Keywords: ethnobotany, garden, medicinal plants, stakeholders

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Methods of IPR protection: Examples of agreements and permitting requirements

The SEB ethics committee has been putting together information for an ethics toolkit of resources to help our members. This presentation will focus on methods related to agreements that protect the Intellectual Property Rights (IPR) of the Indigenous Peoples that we work with in regard to their seeds and plant use. Given that rules change over time with international treaties as well as permitting requirements unique to individual countries, members can be a vital resource to each other in giving examples of wording of agreements and/or experiences with permitting in different countries. Examples will be given of wording
used to protect IPR upon prior informed consent, research agreements, seed/plant collection, herbarium deposit, seed bank deposit and seed transfer. Common dilemmas will be discussed that have been described in the permitting process as well as the monitoring of agreements via Access and Benefit Sharing (ABS) clearing houses.

**Keywords:** Ethics, IPR, seed rights

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**Moving Beyond Blueprint Solutions: Evaluating Conservation Success Across Diverse Equator Initiative Cases Studies**

Despite the continued polarization of blueprint solutions for either “people-free” or people-centered” conservation, communities and researchers around the world are showing that there is no universal approach to conservation. In an era of resource extraction and exploitation, where vested interests span from local to international levels and across sectors of civil society, government, and industry, biodiversity conservation has been defined as a “multilevel commons” problem. To develop enduring approaches to conservation in the current environment, numerous scholars argue for an adaptive co-management approach that involves the sharing of power between government and local resource users in a dynamic, self-organized process of learning by doing. But what does this look like in practice? With a focus on local initiatives that promote conservation in the face of threats from extractive industries, this paper addresses the question: what factors enable community mobilization towards adaptive co-management of biodiversity? To answer this question, this paper critically analyzes five conservation-development projects from the Equator Initiative of the United Nations Development Programme. The Equator Initiative uses a rigorous peer-reviewed process to identify outstanding local community and indigenous peoples initiatives working to meet development challenges through the conservation and sustainable use of nature. The Equator Initiative cases thus provide a rich source of data to evaluate the factors that contribute to successful local initiatives towards conservation and development. Across all five cases, the paper also considers the extent to which the initiatives embrace biocultural conservation, or the integrated promotion of cultural and biodiversity conservation. The role of boundary organizations— which serve to bridge between local, scientific, and policy spheres -and the importance of an enabling international policy environment are also considered.

**Keywords:** biocultural conservation, adaptive co-management, multilevel commons, boundary organizations, policy, extractives

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**Lessons Learned from Ranking Medicinal Plants**

In collaboration with the United Plant Savers, undergraduate students in plant biology classes at Southwestern Oklahoma State University (SWOSU) have assessed medicinal plant species in order to quantify their vulnerability to over-harvest. In addition to providing the scores to the United Plant Savers to be used in setting conservation priorities, each class of students created and presented a poster at a local or national conference. This project requires students to find and sort through data from diverse sources, expand their use of biological terminology, synthesize information in a novel way, and collaborate in order to communicate the results. The majority of SWOSU biology students are pursuing biomedical careers and many view the required plant science courses as obstacles rather than opportunities, yet the medicinal plant assessment project has been successful in engaging students in “authentic” science while developing skills relevant to any STEM career. Students who have assessed plants report they have increased their scientific knowledge and skills, and the vast majority recommend the project for future
classes, despite frequently describing the project as “frustrating.” Here I present three types of lessons learned from conducting this project in five different classes: 1) the scores and plant descriptions created by the students 2) the successes relevant to broader educational goals and 3) suggestions for implementation at other institutions.

Keywords: education, conservation, medicinal plants

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**Biodiversity in a Bottle: The Mead Circle Phenomenon in Southern Appalachia**

Mead (honey wine) is one of the most ancient alcoholic beverages used by humankind, with a deep, rich history in myth, legend, and oral tradition in diverse world cultures. During the past fifteen years, a phenomenon of mead circles has arisen in southern Appalachia. This presentation documents Appalachian mead circles as a distinct sociocultural, ethnobotanical development and contextualizes them within the world history of mead-making traditions. Preliminary results are presented from participant observation in thirty mead circles and oral history interviews with ten prominent mead makers. We highlight sociocultural aspects of Appalachian mead circles and document biological diversity used in the mead making process. Over 150 species of plants were documented and nearly a dozen mushroom species. Implications for teaching engaged ethnobotany in a unique way that excites the lay public outside of institutional programs are explored, as well as the possibilities for contributing “cultural topsoil” to the sustainability movement.

Keywords: alcohol, education, ethnobotany, fermentation, biological diversity, mead, sociocultural phenomenon

**THURSDAY, JUNE 7, 2012**

**SYMPOSIUM 05: MEDICAL ETHNOBIOLOGY AND PHYTOCHEMISTRY**

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**Love Medicine: Plants, Animals, and Affection**

Among the Lakota and other tribes of the Great Plains, plants have numerous uses within the realm of food, medicine, material and ceremony. Often, the way a plant is used is highly dependant on who is using it and how the plant is harvested and prepared. This talk will focus on plants that are traditionally used for increasing feelings of love and affection, and on the many other ways these same plants are used in healing.

Keywords: ethnobotany, Traditional healers, Ethnobiology

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**Resilience in the African Diaspora - Pre 1834 Ethnomedicine in Barbados**

Barbados, of area 430 km, lies most easterly in the Caribbean archipelago at coordinates 13°10’N 59°3’2W. The island was once inhabited by indigenous West Indians, Arawaks and Caribs, who were supplanted by Europeans and enslaved Africans during the Transatlantic Slave Trade. Records show that during the period 1627- 1807 close to 400,000 Africans were shipped to the island against their will in conditions that surely compromised their health status. The harsh working and living conditions led to significant loss of life and chronic health issues, many associated with physical trauma. A plant based
system of health care emerged in the 17th and 18th centuries with residual local flora reportedly applied in West African based ethnomedicine traditions, often involving spiritual components. Though the island was cleared of close to 90% of its virgin plant life to accommodate a sugar cane driven economy, many families of plants were explored for therapeutic modalities. Documentation of “Slave medicine” in Barbados identified sixty plants as important to the tradition with approximately 47% being of the herb habitat. Five families were prominent in the early pharmacopoeia with Euphorbiaceae being the family with the largest number of species used in the treatment of physical trauma including fresh wounds, healing wounds and swellings. Then classified as a separate genus, Chamaesyce had the highest frequency for species cited with applications for venereal disease, wound healing and purging toxins from the blood. Chamaesyce is now considered as a subgenus of Euphorbia and phytochemical analysis supports the healing properties of latex from Euphorbia species. The subgenus Chamaesyce is comprised of approximately 350 species with a global distribution. This citation frequency may therefore be due to the distribution in the Caribbean or a recognition by the enslaved Africans of species related to their practiced West African tradition.

Keywords: African Diaspora, Ethnomedicine, Natural Products

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Sharing Plant Uses with Animals: Plants Used for Feeding and Curing Humans and Animals in the Spanish Inventory of Traditional Knowledge Related to Biodiversity

Spain has a very rich and dynamic traditional ecological knowledge system that has suffered severe erosion over the last decades. This knowledge has been deeply influenced by a rich and diverse historical heritage that includes many centuries old documents from ancient cultures, some over 2000 years old. Spanish acute useful flora comprises around 3,000 species, most of them autochthonous. A team of more than 70 scientists from more than 30 universities and other research centres are developing the Spanish Inventory of Traditional Knowledge. The inventory includes a database with information from over 180 papers. The review of such papers showed that more than 2,300 plant species are used in human and animal food and medicine: 1,681 in human medicine, 1,295 in animal food, 953 in human food and 709 in veterinary medicine. Nearly 14% of the species (313) are shared in the four categories and a very important amount of species are used both for humans and animals: 35% of the species (800) are employed in animal food and medicine, 31% (710) in human food and medicine, 28% (650) in human and veterinary medicine and 27% (624) in animal and human food. This high percentage of overlap between human and animal uses may indicate that the observation of animal behaviour, specially feeding and self-medication behaviours, might have given clues to humans on how to use food and medicinal plants[Lo1].
It also reinforces the idea that food and medicine represent a continuum not only for humans, but also for animals.

**Keywords:** medicinal plants, traditional ecological knowledge, ethnobotany, ethnoveterinary, Food

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**Ethnobotanical Discovery of Plants and Fungi with Antibacterial Activity Against Propionibacterium acnes**

Acne vulgaris is a common skin disorder that affects 85% of teenagers. Propionibacterium acnes is implicated in its pathogenesis, and like many other bacteria, is subject to emerging trends in antibiotic resistance. Novel therapies are in high demand. The aim of this study was to identify new leads for future pre-clinical development from herbal skin remedies used in Italy. We screened a unique natural product library composed of extracts from medicinal and randomly collected plants and fungi from the Mediterranean for growth-inhibitory and anti-biofilm activity in *P. acnes*. Evaluation of 157 extracts from 10 fungi and 58 plants led to the identification of crude extracts from seven species exhibiting growth inhibitory activity (MICs from 64-256 g/mL) and one with biofilm eradication activity (MBEC of 256g/mL). None of these species, with the exception of Sweet Chestnut, have ever been reported for activity against *P. acnes*. All active extracts were examined for cytotoxicity against an immortalized line of human keratinocytes (HaCaT), and while most were non-toxic, one fungal species was toxic at the same concentration required for its anti-acne activity (IC50=256g/mL). Comparison of these extracts to natural product standards by HPLC revealed the presence of chlorogenic acid, p-coumaric acid, ellagic acid, gallic acid and tannic acid. The compound responsible for toxicity in the bioactive fungal sample was determined by LC-FTMS to be polyporic acid. Species used in the traditional medicine for skin infections and inflammations exhibited significantly greater (0.05) growth inhibitory activity than those with no reported topical application, suggesting that herbal remedies remain an untapped source for discovery efforts aimed at development of new therapeutics and cosmeceuticals for acne.

**Keywords:** acne, ethnobotany, medicinal plant, Italy, antibacterial, biofilm

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**Investigation into the chemical paradox of a Hypericum perforatum (St. Johns Wort) traditional skin remedy**

*Hypericum perforatum* ;L., Hypericaceae (St. Johns Wort), is a well-known medicinal herb often associated with the treatment of anxiety and depression. However, there are many traditional topical applications of *H. perforatum* for skin and soft tissue infections. An oleolite preparation of the flowers is widely used in traditional medicine across Eastern Europe and the Balkans. A mixture of *H. perforatum* flowers and olive oil is made and the preparation allowed to age in the sun for at least 40 days, until the
oil color becomes a bright blood red. Recent research has shown that *H. perforatum* flower oleolite reduces both wound size and healing time. In addition, various *H. perforatum* preparations have demonstrated antibacterial and antifungal activity, including activity against MSRA. *H. perforatum* has been well characterized chemically. Many secondary metabolites have been identified including: naphthodianthrones (hypericin), phloroglucinols (hyperforin), flavonoid glycosides (hyperoside), biflavones and anthocyanidins. Phloroglucinol derivatives are widely distributed in the genus but only found in the reproductive tissues. The phloroglucinol hyperforin and its derivatives have been reported as being responsible for the antibacterial activity *H. perforatum*. However, phloroglucinols are quite unstable with light and heat and thus should not be present in the traditional oleolite preparation of *H. perforatum*. Additionally, hypericin can cause phototoxic skin reactions if ingested or absorbed into the skin. Therefore the established chemistry presents an interesting paradox to the traditional preparation of *H. perforatum*. The chemical responsible for the antibacterial bioactivity should degrade in the sunlight as the traditional oleolite is prepared. Alternately, if the hypericin is present in established bioactive levels, the traditionally prepared oleolite should cause photosensitivity; yet none is reported. In this research we examined several extracts of *H. perforatum* and compared them to traditionally made *H. perforatum* oleolite to better understand the chemical composition of this remedy.

**Keywords:** Hypericum perforatum, St. John’s Wort, oleolite, antibacterial, skin infection, phytochemistry

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**Ruderal vegetation as a source of medicinal plants in Mexico**

The source habitat type of wild medicinal plants in a landscape is important for evaluating the impact of medicinal plant gathering on conservation, for bioprospecting and ethnobotanical studies, and for understanding the evolution of vegetation influenced by humans. We reanalyzed three local studies that included habitat information, to evaluate the relevance of weeds in general, and of types of weeds (agrestals and ruderals), as sources of medicinal plants in Mexico. The studies were made in various climatic and cultural regions, the highland, humid and dry tropics. In all of the examples, ruderal habitats (vegetation around settlements, field margins and roadsides) contributed the highest number of spontaneously growing medicinal plants. Cultivated fields (agrestals) only supplied species more or less at the same level as semi-natural habitats, such as grasslands. The results suggest that ruderal plants may be the most significant source of wild growing medicinal plants in Mexico. Cultivated fields (agrestal habitat) contribute much less both in absolute numbers and in relative proportion. Future studies should consider these differences. Ruderal sites and their plants are also an understudied component of the Mesoamerican agricultural system.

**Keywords:** Weeds, Secondary vegetation, Chemical Ecology

**SYMPOSIUM 06: APPLIED ETHNOBIOLOGY**

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**The Role of Ethnobotanists in Regulation**

It is incumbent upon ethnobotanists to not only collect ethnobotanical information and present it, but to promote and, if possible, assure the appropriate understanding and use of that information.

**Keywords:** Regulation

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Ethnobotany in Peace Corps Masters International Programs

Peace Corps Masters International Programs allow students to combine graduate school with two years of Peace Corps service. The research conducted by students in the program covers a wide range of academic disciplines and research in ethnobotany is one option available to participating students. The design and implementation of research programs in combination with Peace Corps has advantages and disadvantages for both students and universities participating in Peace Corps Masters International Programs. This talk will cover the advantages and disadvantages using specific examples from projects conducted by students.

Keywords: Peace Corps

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Protecting and Growing Allium tricoccum (wild leeks) as a Specialty Crop in Missouri

Allium tricoccum (wild leeks) is an edible plant native to most of Eastern United States and Canada that grows naturally in deciduous forests. In Missouri, wild leeks are documented in 19 counties. Threat of overharvest in Eastern States like West Virginia, North Carolina, Virginia and New York has prompted adaptation of conservation measures. In Missouri, wild leeks are not as popular as in these states but the risk of depleting natural populations exists. Before this occurs, the Native Plants Program at Lincoln University is doing outreach and education using research based data done in other states. Part of this study includes evaluating wild leeks as specialty crops to discourage digging in the wild. Five farmers for the Central and Southeast region of Missouri are doing their own observations. Plant growth will be measured for 3 or more years at LU campus in raised beds, pots and field plots. Preliminary results on numbers of bulbs per plant and bulb size showed no differences for wild leeks grown in pots with three different soil media. Survival was close to 98% and animal disturbance and diseases were not observed. Wild leeks acceptability is being tested, in 2015, during food tasting sessions, volunteers tried and rated flavor, aroma, texture, appearance and acceptability of recipes with wild leeks. Average rates for flavor, texture, aroma, presentation and overall acceptability of five recipes containing wild leeks was 4.2 to 4.5, with 5.0 being excellent. More evaluations will be done in 2016. The best recipes are served in an annual event called Dining Wild to promote wild leeks and other native edibles in a full course meal. One of the expected outcomes is to make wild leeks available in farmers markets across Missouri by 2017. This study receives funding from the Missouri Department of Agriculture and the USDA.

Keywords: Native edible plants, niche crops, forest farming, Specialty Crops

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Resilience in Lucy's Woods: The Mixed-Mesophytic Seasonal Round as a Framework for Post-Mining Restoration

Lucy Braun was the first to posit the ecological and geological coherence of the forest system covering the Central Appalachian Plateaus, which she named mixed mesophytic. Braun also noted the resilience of the second growth mixed-mesophytic forest following the extraction of the virgin forest in the first decades of the 20th century. I explore the consistency of this coherence and resilience since prehistoric times in relation to cultural practices. Based on ethnographic research conducted in southern West Virginia over the past two decades, my slide-illustrated presentation explores continuities of
contemporary engagement with ntfps with the prehistoric and historical record. I also consider linguistic evidence that supports theories advanced by archeologists (Munson) and environmental historians (Davis) that the mixed mesophytic forest system was shaped and influenced by Native American horticultural practices. I argue that the mixed mesophytic forest system can be seen as an indigenous landscape that appropriated settlers, who adapted European forms of commoning into a system learned from Algonquian neighbors (Estyn-Evans). The extreme forms of extraction brought by the twentieth century appropriated the agroforestry of settler populations in order to support an industrial workforce. This system, though constrained by company-imposed rules, has been resilient into the present, with the exception of communities separated from their customary sites of hunting, gathering, and gardening by mountaintop removal mining. How we define the object of restoration depends on where we locate resilience in the face of extraction. I suggest that the capacity for resilience is distributed throughout a mixed mesophytic forest thinking system endemic to the Appalachian Plateaus (Bateson). The customs of the seasonal round are the outcroppings of a thinking system of land and people, which I argue approximates what Aldo Leopold saw as the land community. I ask what are the implications for community-based ecological restoration in the Appalachian coalfields?

Keywords: mixed-mesophytic forest, oral tradition, coalfield commons, community-based reclamation

Stepp, John Richard  
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Building upon a successful conversation we started in Clanwilliam South Africa last year, this session presents an opportunity for all members to dialogue and converse about the future of the society. Immediate past-president Rick Stepp will present an overview and then serve as moderator for the ensuing discussion.

POSTER PRESENTATIONS

TUESDAY, JUNE 6

Student Posters PO01-PO09 are being considered for the Morton Award

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It's not a weed, it's food! Promoting women and children's consumption of micro-nutrient rich African indigenous vegetables in Malawi and Zambia

Background: Exotic vegetable cultivation is labor and water-intensive in southern Africa hindering dietary diversity. In Zambia and Malawi, dietary diversity must be addressed as only 22% (DHS2013) and 29% (DHS2011) respectively of children under-2 consume a minimum acceptable diet and about 10% of reproductive-age women are undernourished. African Indigenous Vegetables (AIVs) are often wild or the byproduct of existing cultivation, drought/pest resistant and nutrient-rich. Catholic Relief Services (CRS) conducted a rapid assessment of AIV knowledge, availability and popularity in Chiptata (Zambia) and Chikwawa (Malawi) to determine their potential for promotion. Methods: The rapid assessment included 105 participants from focus group discussions with mothers and fathers, key informant interviews with multi-sectoral frontline workers, and market interviews with food vendors in the two districts. Results: Communities acknowledged eating AIV’s with a greater variety reported in Zambia than Malawi (35 versus 16 plants). AIVs were referred to as tasty, readily available, often free
and requiring less water than exotic vegetables to grow. Respondents also listed perceived health benefits, including high levels of nutrients and disease prevention. Despite this, some stigma exists around AIVs and promotional efforts are needed to ensure pregnant women and young children consume these micronutrient-rich foods. Conclusions: Social and behavior-change interventions to improve dietary diversity should include messages to counter stigma and promote AIVs. Peer-to-peer nutrition promotion interventions should promote AIVs. Multi-sectoral frontline workers should be trained on nutrient content, preparation, and preservation to retain nutrient values of AIVs. Additional studies are necessary to establish health benefits of AIV consumption, their contribution to child growth, and the role of sodium bicarbonate (a commonly reported AIV preparation ingredient) on water-soluble vitamins. Reference: Demographic Health Survey (DHS). http://www.dhsprogram.com

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**Anti-acne activity of *Schinus terebinthifolia*, a medicinal plant traditionally used to treat skin and soft tissue infections**

*Schinus terebinthifolia* Raddi, Anacardiaceae, has a long history of use in traditional medicine in South America. All parts of the plant are commonly used as an astringent, antibacterial, antiviral, and wound healing agent. Due to its relevance to skin infections, it was selected for investigation against *Propionibacterium acnes*. *P. acnes* is a Gram-positive, anaerobic bacterium that is involved in the pathogenesis of acne, a disease which affects more than 45 million Americans. Through improper use of antibacterial treatments, *P. acnes* has evolved antibiotic resistance and thus is an important target for drug discovery efforts. Extracts of the leaves and fruit were initially screened for growth inhibitory action under anaerobic conditions against *P. acnes* at 256µg/mL at 37deg C for 72 hours. Extracts with 45% inhibition were retested at a range of 4-256 ug/mL by serial dilution. The EtOAc partition of the fruit extract demonstrated the greatest activity with a minimum inhibitory concentration, or MIC50 of 64 µg/mL and MIC90 of 256 ug/mL. In conclusion, we found that extracts of a traditional medicinal plant for skin infections did exhibit notable bioactivity against *P. acnes* growth. Future work will focus on further analysis of this fraction in the context of biofilm models and cytotoxicity tests with human keratinocytes.

**Keywords**: acne, anti-infective, antibacterial, *Propionibacterium acnes*, antimicrobial plants, Phytochemical screening

PO03, **Cai, Jessie** [1], **Lyles, James** [1], **Quave, Cassandra** [2].

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**Chemical characterization of tinder fungus *Fomes fomentarius***

Humans have employed mushrooms for nutritional, medicinal, psychoactive, and other uses for as long as 5,000 years. In fact, the tinder polypore, *Fomes fomentarius*, was found on the oldest recorded natural human mummy, Ouml “the Ice Man,” dated 3,000 BCE. A bracket fungus best known for its use as tinder, *F. fomentarius* has also been used historically for a wide variety of traditional medicinal remedies. Greek physician Hippocrates prescribed it for cauterization during 5th Century BCE. Uses of European medicine for *F. fomentarius* include treating gastrointestinal disorders and bronchial asthma; of traditional Chinese medicine, for oral ulcers and various cancers; and of Indian medicine, for high blood pressure and constipation. Modern studies have verified anti-tumor and anti-inflammatory properties. Previous research has identified various phenolic acids and flavonoid compounds as responsible for aforementioned bioactivity. These compounds include fomentariol, gallic acid, mallic acid, salicylic acid,
and protocatechuic acid. However, variety in chemical results by differing publications compel us to characterize an authenticated specimen using fruiting bodies of *F. fomentarius* collected in Sicily in 2015. The fungus was ground and extracted by sonication in MeOH. This MeOH filtrate was then evaporated and freeze-dried to yield a powdered red-brown extract. Flash chromatography was used to refine the crude extract. Then, high-performance liquid chromatography (HPLC) and HPLC-MS was used to investigate the relative abundance of identifiable compounds. In this research, we seek to characterize these chemical constituents of *Fomes fomentarius* to clarify the compounds present for future research investigation.

**Keywords:** *Fomes fomentarius*, fungi, phytochemistry, mushrooms

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“Stocking the hunting ground”: Insights into the supply of “wild”; ginseng (*Panax quinquefolius* L.) from Pennsylvania, U.S.A., and implications regarding industry tracking of an important internal

Pennsylvania is one of nineteen states in the United States of America (U.S.A.) that exports wild American ginseng (*Panax quinquefolius* L.) roots into the international marketplace under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) treaty. Given concerns over the sustainability of this centuries old trade, there is an urgent need to better understand the wild supply chain along with any husbandry involved in the production of exported roots. Since 2012, we have been employing an ethnobotanical approach to gather confidential insight into wild ginseng supplies from Pennsylvania via an annual survey instrument mailed to people involved in the sale of wild ginseng (gathered from licensed buyer transaction logs). Results indicate that a variety of husbandry practices are used to produce ginseng which ultimately is sold and traded as “wild,” ranging from intensive agroforestry (e.g., “forest farming”) to enrichment plantings (e.g., “stocking” of collection areas). Results obtained between 2012 and 2015 revealed that 23% to 57% of sellers participating in this survey effort indicated that their “wild” ginseng originated from intentional planting on forestlands. This scenario presents a dilemma regarding interpretation of “wild” harvest data because current industry reporting mechanisms are inadequate to accommodate the complex range of husbandry practices being utilized, and which often result in “wild” appearing roots. Moreover, producer concerns and misgivings about issues such as price gouging, theft, taxation - coupled with a lack of consensus around what actually constitutes “wild”- continues to drive secrecy around forest based husbandry and cultivation practices. These results suggest that changes in transaction reporting paperwork alone will not effectively bring clarity to supply origins. We suggest that annual confidential surveying of root sellers could serve as an important tool to help inform state and federal ginseng conservation and management programs.

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**Examining Non-Lethal Doses of Alpha Amanitin in *C. elegans***

Amatoxins are a subgroup of at least eight toxic cyclic octapeptides that occur in several genera of mushroom, including those of the genus Amanita. Human ingestion of these mushrooms is usually fatal, with toxicity manifesting in tissues that possess high rates of protein synthesis due to the ability of the
toxins to inhibit RNA polymerase II. We studied the cellular effects of the constituent alpha amanitin using the model organism Caenorhabditis elegans, a nematode known for demonstrating genetic and molecular effects analogous to humans, is inherently sensitive to the amatoxins including alpha-amanitin. We examined the effect of the toxin in non-lethal concentrations to determine the influence on larval growth and development, on the induction of apoptosis in the germline of C.elegans, and on the level of gene expression of several mRNAs involved in apoptosis. Further, we compared the effects of commercially available amanitin to a crude extract derived from Amanita virosa order to determine whether there is an “entourage effect” from other constituents in the fungus. Our studies have outlined a novel approach to examine the actions of nature-derived compounds using C.elegans as a model.

Keywords: Amanitin

PO06, Taylor, Dakota [1], Huish, Ryan [1], Peters, Jacob [2], Allen, Skyler [2], Munson, Benjamin [2], Dellis, Katlin [3], Stanley, Conner [2].

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Assessing a Strategy of Climate Change Adaptation for Maple Syrup Producers in the Southern Appalachians: Diversification of Maple Species as Sap Sources

Sugar maple (Acer saccharum; Marsh) is a key cultural and ecological resource from northeastern Canada to the southern Appalachians. Following current projections of climate change, however, this cultural icon may be threatened with population range shifts, decreased health, lower sap volume, and inferior sap quality. This may be particularly relevant in the southern extent of its range in the Southern Appalachian Mountains, where this research is being performed. To help adapt to these changes, some maple syrup producers have begun tapping alternative maple species that are more resilient to climate change, including Red Maple (Acer rubrum; L.), Boxelder (Acer negundo; L.), or Silver Maple (Acer saccharinum; L.), which is then combined with the Sugar Maple sap during processing. More detailed research needs to be performed on these alternative maple species to help define the effects this adaptation strategy may have on the final product. Beginning spring 2016, data on sap volume, quality, and sugar content for each of these four maple species were collected from two sites in Wise County, Virginia. An additional eight sites focusing only on sap quality are located in the Appalachian region of Virginia, West Virginia, Kentucky, Tennessee, and North Carolina, totaling more than 100 taps. Sugar content was quantified in units of Brix using a field refractometer. Sap quality is currently being measured by analyzing antioxidants and total phenolic concentration using HPLC and spectrophotometry. Results show that Box Elder has the highest sap yield when compared to other species (average 24 liters per tap) and Sugar Maple and Silver Maple had the highest average sugar concentrations throughout the season (both 1.6 Brix). Results thus far justify continued research and suggest that diversifying maple species as sap sources may be a viable strategy of climate change adaptation for maple syrup producers.

Keywords: Maple Syrup, Climate Change, Southern Appalachia

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Conservation implications of decreasing misidentification among the genus Actaea.

State imperiled mountain bugbane (Actaea podocarpa DC, Ranunculaceae) is threatened by ecological and anthropogenic pressures such as species misidentification, resulting in unintentional harvesting. By developing comparative outreach material for herb diggers, lay botanists, and the general public that differentiates A. podocarpa from similar-looking related species such as: A. rubifolia, A. pachypoda, A.
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**Luteolin and its effect on V-ATPase activity in C. elegans**

Luteolin is a naturally occurring flavonoid that is sold as an over the counter dietary supplement. Plants rich in luteolin have long been used in Chinese medicine to treat a variety of ailments. Recent research has shown that luteolin inhibits the V-ATPase enzyme in cells. V-ATPase is a proton pump that works both on the cell surface and on the surface of many organelles including endosomes, lysosomes, and secretory vesicles. It acts by using energy from ATP to create a transmembrane hydrogen ion gradient which is often used to drive many secondary active transports. Although luteolin is said to have a number of health benefits, the direct mechanism of action is unknown. We have used the model organism *Caenorhabditis elegans* to further investigate how luteolin affects the V-ATPase. Here we demonstrate the effect of luteolin on the V-ATPase on the growth and development of the nematode, its brood size, and the function of the V-ATPase in the sperm secretory vesicles. This study contributes to the establishment of *C. elegans* as a screening model for compounds found in medicinal herbs.

**Keywords:** Luteolin

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**Herbivory-induced Metabolite Biosynthesis and Diversification in Ethnopharmacological Context**

The Madagascar periwinkle (*Catharanthus roseus*) produces over 100 alkaloids, many of which show activity against cancers and other diseases. These specialized metabolites are one very important way that the plant protects itself from predators, microbes, and other competitors. In this study, we investigate the alkaloid profile of in vitro tissue cultures that have been elicited with a plant defense hormone in order to increase and diversify biosynthesis. Their alkaloid profiles, including at least one previously uncharacterized metabolite, are compared and characterized by MS/MS. A comparison of the alkaloid profiles from *C. roseus* native roots, untreated, and elicited hairy root lines suggests that elicitation with the plant defense hormone, methyl jasmonate, uniquely altered alkaloid biosynthesis by diverting the metabolic pathway. Building on this concept, by creating tissue cultures of other plants of medicinal interest, we may be able to efficiently and reliably create unique accumulations of metabolites that the plant produces as a specific and reproducible defense response, therefore increasing the chance for the production of bioactive defense compounds.

**Keywords:** medicinal plants, pharmacognosy

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**Wild Edible Plants in the Giriama People of Coastal Kenya**
Plants are an evolutionary pillar to the existence of humans and animals; particularly as provision of food. Our study focused on how the Giriama people of Coastal Kenya utilize wild plants to meet their fruits and vegetable needs from the indigenous local sources. The people are somehow conservative and are attached to their cultural heritage. Purposive sampling and non-destructive photographic methods were used to gather information from six villages around Bamba in Kilifi County. The photograph shots were compared against voucher specimens that had earlier been sampled and deposited at the national Museums for authentication. A total of 29 wild vegetables, 37 fruits and their uses were documented. The increased use of these plants by the local people have made the plants more or less of domestic than wild, though not much attempts of conservation have been made. It emerged that the plants are/were being used elsewhere, routinely and traditionally, for the same purposes or/and source of traditional medicine. We concluded that the traditional uses of these plants could, possibly, be the source reasonably high levels of immunity by the indigenous local people to some common endemic diseases in the area. 

Keywords: plants, people, uses, Giriama, Kenya, Wild, Indigenous, vegetables, fruits, medicinal plants

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**Traditional Medicine Usage and the Transmission of Traditional Ecological Knowledge in Three Villages Near Phnom Kulen National Park**

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Traditional ecological knowledge refers to knowledge regarding the relationships between humans and the natural environment. This knowledge and skill set is acquired by local and indigenous peoples through generations of direct contact with the environment, and is often shared in an intergenerational pattern of verbal retelling and instruction. Traditional medicine is one component of traditional ecological knowledge, and this paper outlines the investigation of traditional medicine usage and the transmission of such knowledge in three villages near Phnom Kulen National Park in Siem Reap, Cambodia. The study was conducted through semi-structured interviews at homes that were both randomly and purposively selected. The data collected regarding plant names, both Khmer vernacular and -after identification using outside resources -Latin scientific names was recorded into the School for Field Studies list of medicinal plants found near Phnom Kulen National Park. A total of 111 plants were described by 27 interviewees, and 82 species of the 111 were new additions to the aforementioned plant list. Fifty-two species described are used for treatment during pregnancy and the postpartum period, while other common medicinal purposes include treatment of cold or flu symptoms, or of stomach ache or diarrhea. The respondents ranged in age from 27 to 81 years old, and each was able to describe some medicinal plants and their uses. Twenty-three respondents stated that they learned about traditional medicine from their parents or grandparents, which implies that intergenerational transmission of knowledge is the most common mechanism in the study locations. Overall, data from this study indicate that traditional ecological knowledge about traditional medicine is not being lost and traditional medicine is still widely utilized in the three villages.

Keywords: Traditional Medicine, medicinal plants, traditional ecological knowledge, transmission of knowledge, Phnom Kulen National Park, Cambodia

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**The Development of a Validated Tool to Record the Medicinal Uses of Local Appalachian Plants**

The Appalachian region is plagued by an opiate overuse problem. Our initial pilot study sought to explore how herbs are used for pain in the Appalachian area, to develop an efficient self-survey method to gather...
ethnobotanical information, and to gather information from which to compare local medicinal herb use to that of Traditional Chinese Medicine. An IRB-approved self-survey was distributed at an herbal conference for participants to complete in detail on their use of plants for analgesia. This initial study demonstrated that a mail-sent survey was not an effective means to gather information in part due to ambiguities associated with word and in part due to the small number (N=2) of surveys actually returned. The differences in word usage between Western trained medical personnel and lay persons led us to expand the scope of the study. We plan to shift the focus to cataloguing the various plant uses so that we may apply data mining techniques to estimate probabilities that a given plant is used for a given purpose. As we organize the reported uses into validated text clusters, we will better identify how pain etiology might impact herb selection. Our reporting of this small study led a cohort of researchers to begin to collaborate. One group plans to develop Caenorhabditis elegans as a potential screening model for herb activity. Another emerging collaboration involves initial screening for herbs with potential antibacterial activity. Further, organization of plant use based upon text clusters will facilitate comparisons across cultures. We plan to correlate Appalachian use with Traditional Chinese use for comparisons at the constituent level. Though our initial pilot failed its purpose, it has led us to redirect for multi-purpose results. This report demonstrates how human interactions with plants can lead to improved human interactions with humans.


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Local knowledge on the uses, habitat and abundance of multipurpose Mimusops species in Benin (West Africa)

Non-Timber Forest Products (NTFPs) are exploited by local people for food, medicines, energy, construction, etc. and this way play important role in most aspects of rural wellbeing. Multipurpose NTFP species typically experience higher harvest demand because of their multiple uses, which, when combined with unsustainable land use practices may threaten population viability. We assessed local knowledge on the uses, habitat and population status of Mimusops andongensis and Mimusops kummel both multipurpose NTFP species in Benin (West Africa), to promote their valorization and conservation and thus sustain local knowledge on their uses. One hundred households were randomly selected for structured interviews for M. andongensis and 500 for M. kummel. The relationship between age, sex and ethnic groups and the species uses was assessed using comparison and correspondence analyses. Nearly all organs of the species were used. Both species were mainly exploited for medicinal purposes but also in construction and as firewood. We found similarities in the use of the species organs. Most informants reported that populations of M. andongensis were decreasing, although some felt that they were increasing, whereas less than one-third said that M. kummel was decreasing. There were strong relationships between gender age and ethnic affiliation of the users and the exploited organs of both species. Potential uses exist based on both the past and current uses of the species and in comparison to other countries where they are exploited. However, further research on the species seeds germination and propagation ability are necessary for their valorization and conservation.

Keywords: NTFPs, Ethnoecology, medicinal plants, Mimusops andongensis, Mimusops kummel

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More than blue?! Surprises during dyeing experiments with woad (*Isatis tinctoria; L.*) and an explanation through dye analysis

In Europe, woad was used for millennia to dye blue. The earliest woad-dyed textiles in Europe to date have been found in the salt mine in Hallstatt, Austria. They are up to 3500 years old, dating from the Bronze Age (1500-1100 BC) and Iron Age (850-350 BC). In these textiles, indigotin, indirubin and isatin were detected by high-performance liquid chromatography with photo diode array detection (HPLC-PDA). These components clearly indicate vat dyeing, but do not enable a conclusion which plant species yielding indigoids the people of the Hallstatt Culture used. Due to the textiles’ prehistoric context, it was most probably woad. The starting point for the research presented here was the requirement to produce replicas of these textiles. Three processing and dyeing methods using woad (*Isatis tinctoria; L.*) were successfully recreated in an iterative experimental process, based on ethnographic, historical and experimental literature: (1) dyeing with fresh leaves, (2) dyeing with green and couched woad, and (3) dyeing with woad pigment in urine vats and madder-bran-vats. During these experiments, several colours other than the typical blue also emerged. Dye analysis using HPLC-PDA showed that the most predominant component in the blue samples was indigotin. The colours mint, purple, beige and green were achieved when indirubin and flavonoids appeared in higher concentrations. The composition of the woad-related components detected on dyed samples enabled us to retrace the dyeing methods used. Antraquinones originating from madder (*Rubia tinctorum; L.*) used in the madder-bran vat were also detected, but in different ratios to that of madder mordant dyeings. Further research is required to prove whether the components detected in reference samples can be used to identify dyeings with woad or the use of madder-bran vats in prehistoric and historic textiles.

Keywords: woad (*Isatis tinctoria; L*), indigo, natural dye, dye analysis, HPLC-PDA, experiment, fermentation vat

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Quantitative ethnobotany in South Korea - Diversity of useful plants as a function of species richness

From 2007 to 2011, Korea National Arboretum conducted ethnobotanical survey and published several books of ethnobotanical data for the whole country, South Korea. Ethnobotanical information was obtained through informed consent semi-structured interviews with 1,514 informants. Informants with a sound traditional knowledge of useful wild plants, mostly elderly long-time residents, were interviewed. Using the methodology of quantitative ethnobotany allied to the ecological parameters (species richness, species abundance distribution) the following results were obtained: 749 inventoried species gathered in 127 families, presented from 1 to 26 means of use in country. The largest use of the plants is related to edible plants in order to be used in herbs, salaries, and spice. The largest use value was attributed to the *Plantago asiatica*, L. (Plantaginaceae). The most frequent species were *Artemisia indica*, Willd. (Asteraceae), *Plantago asiatica*; L. (Plantaginaceae), *Kalopanax septemlobus*; (Thunb.) Koidz. (Araliaceae), *Pinus densiflora*; Siebold & Žucc. (Pinaceae), *Morus alba*; L. (Moraceae), and *Aster scaber*; Thunb (Asteraceae). To characterize the relationships between use plant species richness and species richness of the local flora at provincial level. For nine provinces, useful species richness tends to increase with species richness at local floristic richness. The recognition of patterns and process of ethnobotanical
diversity provides a first step in identifying relationships amongst local botanical knowledge and external conservation priorities.

Keywords: ethnobotany, quantitative ethnobotany, species abundance distribution, species richness

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Cold Period Developed the Buckwheat Culture in Fukui, Japan

Echizen area (northern Fukui prefecture of central Japan) is well-known for a buckwheat noodle (Echizen-soba). The history of buckwheat in Fukui was dates back to 400 years ago. It was spread in the area for famine relief by the feudal lord in those days. It became a culture of Echizen area. The history of buckwheat plantation in Japan is very long, at least 3300 years. It was introduced from the Eurasian Continent and then Emperor encouraged the cultivation for famine relief in 8th century. The high percentages of buckwheat pollen were observed in soil samples from Nara (the capital city in those days) during the 8th century. Comparing with this evidence, the history of buckwheat cultivation is very short in Echizen area although the southern part of Fukui prefecture had a strong contact to the capital city, Nara and Kyoto for food supply. In this study, we took sediment cores from Lake Kitagata, Echizen area, and performed pollen analysis in the cores, in order to detect when buckwheat cultivation started in the area and to see if the cultivation was intensive after 400 years ago. The buckwheat cultivation in the Echizen area dates back to late 13th century and it was as intensive as that after 400 years ago. It is said that Little Ice Age started from 13th Century in Japan, so people has already started it for famine relief.

Keywords: Echizen-soba culture, pollen analysis, Lake Kitagata, Little Ice Age

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Variation in Secondary Metabolites of the Medicinal Plant Ligusticum porteri Associated with Light Environment

Ecological theory predicts that plants in the shade will be better defended against herbivores than plants in higher light environments. Since defense compounds are frequently responsible for medicinal activity, this suggests that plants in the shade will be a richer source of the bioactive compounds used in herbal medicine. Previous work has shown that extracts of Ligusticum porteri (osha) from the shaded aspen understory have greater antibacterial activity than extracts from plants in open meadows. Suggesting a connection to defense chemistry, this plant is host to aphid colonies in open meadows but to a much lesser extent in the shade. We examined variation in the bioactive compounds of 20 methanolic extract of L. porteri roots harvested from different light environments. We used high-performance liquid chromatography (HPLC) to quantify variation in three secondary metabolites: Z-ligustilide, ferulic acid and butylidenephthalide. Gas chromatograph-mass-spectrometer (GC-MS) analysis. Peaks produced by GC-MS were identified and compared using Automated Mass Spectral Deconvolution and Identification System (AMDIS V2.1) software. Initial HPLC and GC-MS revealed plant-to-plant variation in phenolics, terpenoids and phthalides in the methanolic extract of L. porteri. Data analysis is on-going, but we have
identified several compounds potentially unique to plants from low-light environments. Variation in these compounds may underlie differences in both herbivory and medicinal activity with light environment in this species. 

**Keywords:** GC-MS, HPLC, Ligusticum, medicinal plants, Light Environment, Chemical Ecology

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**Growing Medicinal Plants in Home Gardens: Sanguinaria canadensis in the St. Lawrence Valley**

*Sanguinaria canadensis* (Bloodroot), a perennial in northeast America, is often wild-crafted for medicinal use. This medicinal species is also occasionally grown as an ornamental. We explored populations of *S. canadensis* grown in homegardens and compared them to naturally occurring forests site populations in the St. Lawrence Valley in Northern New York. We hypothesized that populations nurtured in homegardens might have greater rhizome biomass and ramet density due to greater resource availability. Preliminary analysis data using analysis of variance (ANOVA) indicated that there is a significant difference among all populations with respect to rhizome biomass (P< 0.05), total number of leaves (P<0.05) and, leaf area (P< 0.001). Further, there is significant variation in several edaphic variables measured at each of these population locations including moisture (P<0.001) and canopy cover (P<0.001). A significant difference (P<0.05) in rhizome biomass and ramet density among homegarden and forest populations indicates that *S. canadensis* grown in reflects the favorable microenvironment conditions available in homegardens.

**Keywords:** medicinal plant

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**What's In a Name? Defining Who We Are and What We Do**

This poster presentation presents the results of the 2016 Society for Economic Botany membership survey. 192 current and former members responded to a range of questions regarding their research interests and the effectiveness of the society across a number of domains. A particular focus of the survey was on the term “economic botany” and whether it adequately captured the diversity of our present membership. Other questions dealt with publications, strategies for outreach and future conference planning. While there was a range of responses, there was also some consensus on ways to move forward and increase membership.

**Keywords:** Identity, Academic Societies, The Future

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**Comparative & Systematic Wood Anatomical Study of Eleven Species of Combretaceae In Nigeria**

A comparative wood anatomical study of eleven species in four genera in the family Combretaceae was carried and this was with a view to identifying wood characters of taxonomic value in the diagnosis, delimitation and subsequent identification of members of the family. Collection of accessions of the species was made from different parts of Nigeria. Transverse, tangential and radial longitudinal sections of the stems of the species were cut using Reichert sliding microtome. Both qualitative and quantitative characters of the wood anatomy of the taxa were observed and documented. Quantitative data were subjected to Analysis of Variance, Single Linkage Cluster Analysis (SLCA) and Principal Components Analysis (PCA). Results revealed that wood in the eleven taxa is diffuse porous. Coarse-grained aliform confluent paratracheal parenchyma delimits *Terminalia ivorensis* from the rest of the taxa. Gross examination of wood anatomical characters reveal some distinctions .the type of vascular ray is
classificatory in genera studied. Vessel diameter was highest in the genus Combretum while the genus Anogeissus represented by Anogeissus leiocarpus had the least. Ray height vary significantly (p < 0.05) among the eleven species studied in the family. The PCA factor loadings reveal vessel diameter as important quantitative data useful in separating the eleven species.

**Keywords:** Transverse section, Combretaceae, delimit

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**Pollinator visitation between native and non-native plant species of southeastern U.S.**

There are a number of studies examining pollination competition between native and non-native plant species. Perhaps more important are interactions between native and non-native plant species, and their native and non-native pollinators. These interactions enhance ecosystem services which is described as any positive benefit that wildlife or ecosystems provide to people. Pollinators are critical to the success of agriculture. How the European honey bee (*Apis mellifera*) interacts with native bees and other pollinators in the pollination of native and non-native plants is little understood. In this study eight 3m plots were alternatively planted with native plants from southeastern U.S. and non-natives from Europe and Asia. Plots were randomly sampled for pollinator visitation for 15 min each day over a month period during the summer of 2015; Data was analyzed using the Likelihood Ratio Test (LRT) for goodness-of-fit between the native and non-native field plots. Among the many insect visitors observed in the plots there were three predominant pollinators; the European honey bee (*Apis mellifera*), the American honey bee (*Colletes hyalinus*), and the American bumble bee (*Bombus pennsylvanicus*). The abundance of the American honey bee on visitation to native and non-native plants favored the visitation of native plant species (p=0.00717) while the visitation of the European honey bee (p=0.1443) and the American bumble bee (p=0.1806) to native and non-native plants was not significantly different. While the visitation rate of all pollinators between native and non-native plants was not significant (p=0.01229) there did appear to be a trend toward the visitation of native plants. This trend needs to be examined future. Continued important of pollinators to ecosystem services will be important to the future of agricultural productivity.

**Keywords:** Pollinators, Honey Bee, Bumble Bee, Native plants, Non-native plants

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**Ethnobotany Alumni: Jobs of the Graduates of Bachelors Programs in Ethnobotany**

Frostburg State University, www.frostburg.edu, is celebrating the graduation of thirty students in the undergraduate Bachelors of Science in Ethnobotany since the program’s inception in 2007 and the first graduates in 2010. Located in the Appalachian Mountains of western Maryland the program is situated in an ideal location for field-based courses which integrate research and service learning. The field-based program’s graduates are primarily employed in ethnobotanical fields related to applied conservation projects. Learn about the careers of graduates of Frostburg State University’s Ethnobotany Program and meet several returning alumni and current students.